



DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A	EP 0 823 270 A (PIONEER ELECTRONIC CORP ; PIONEER LDC INC-(JP)) 11 February 1998 (1998-02-11) * abstract * * page 10, line 22 - page 11, line 52; claim 17; figure 1; table 1 * * page 13, line 46 - page 14, line 6 * * page 17, lines 21-47; figures 1,3-13 *	1-5	G10H1/00 G10H1/36
A	EP 0 903 169 A (KONAMI CO LTD) 24 March 1999 (1999-03-24) * abstract; figures 7,12,17 *	1-5	
A	EP 1 132 888 A (BESTSOFT CO LTD ; HWANG BOK HA (KR)) 12 September 2001 (2001-09-12) * abstract; figure 1 *	1-5	
A	JP 08 335088 A (FUJI ELECTRIC CO LTD; FUJI FACOM CORP) 17 December 1996 (1996-12-17) * abstract *	1-5	
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			G10H
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 13 September 2004	Examiner Feron, M
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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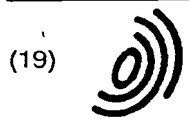
**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 04 01 0750

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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13-09-2004

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(11)

EP 0 823 270 A2

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
11.02.1998 Bulletin 1998/07

(51) Int. Cl.⁶: A63F 9/22
// G06F161:00

(21) Application number: 97113499.4

06. Okt. 2004

(22) Date of filing: 05.08.1997

(84) Designated Contracting States:
AT BE CH DE DK ES FI FR GB GR IE IT LI LU MC
NL PT SE

(30) Priority: 05.08.1996 JP 206234/96
30.09.1996 JP 258331/96

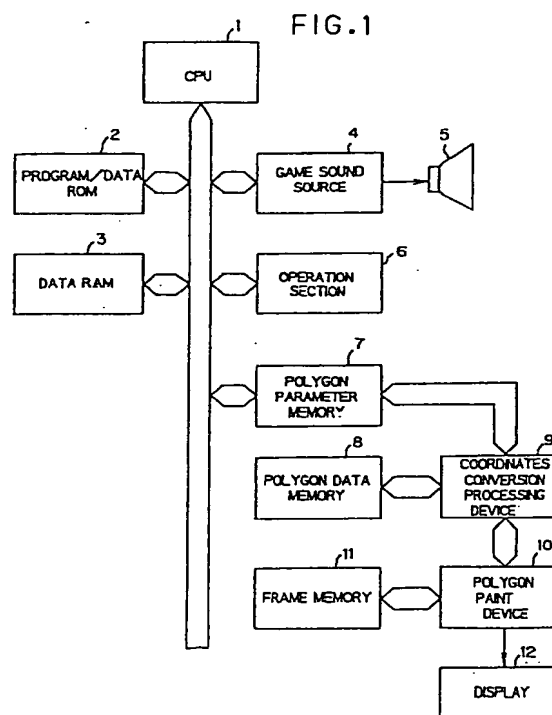
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(54) Video dance game apparatus

(57) A video dance game apparatus for displaying an image of at least two dancers on a screen and controlling the dancers to play various dance performances in accordance with an external operation to thereby offer a dance game, is provided with: an image displaying device (10, 11, 12) for displaying the image of the dancers; a dance music output device (4, 5) for outputting a music signal indicating a dance music; a beat information generating device (1) for generating beat information on the basis of the music signal; a dance performance data selecting and reading out device (1) for selecting and reading out one of the dance performance data pieces stored in a dance performance data memory device; an image control device (7, 8, 9) for controlling the image displaying device to change the image of the dancers such that the dancers play a dance performance corresponding to the read out dance performance data piece; an operation device (6) by which the external operation is inputted, for operating the dance performance data selecting and reading out device in accordance with the external operation to select and read out the one of the dance performance data pieces; and a score calculating device (1) for calculating a game score on the basis of a time lag between a read-out timing of the dance performance data piece and a generation timing of the beat information.



EP 0 823 270 A2

Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a video dance game apparatus, which displays at least two dancers on a screen and controls the dancers to play various performances on the screen by an external operation or drive to thereby allow a dance game, and also relates to a program storage device readable by the apparatus.

2. Description of the Related Art

There is a fighting game apparatus as one kind of a television game apparatus, in which two characters (i.e. two persons or fighters) are displayed on a screen. This is intended to control one character to play a performance by an external operation or drive to thereby defeat the other character. That is, two game players compete with each other or one game player competes with a computer by inflicting a damage to the competitor's character or defending ones own character from the competitor's character by a timing of playing the performance and a selection of the kind of the performance.

However, in such a conventional game apparatus, the timing of playing the performance may be a timing when an effective damage can be inflicted on the competitor's character. In other words, there is no game apparatus which involves competing for superiority or inferiority of sense of rhythm, such as moving a character on the screen in harmonization with or in time to a constant musical rhythm.

Moreover, in not only the fighting game but also most of the conventional game apparatuses, one game player competes against the other game player or the computer as for the operating or driving skill. There is no game of competing for the cooperation or harmonization between two game players.

SUMMARY OF THE INVENTION

It is therefore an object of the present invention to provide a video game apparatus in a perfectly new field for competing for a high score by letting at least two dancers on the screen play a dance cooperatively.

The above object of the present invention can be achieved by a first video dance game apparatus for displaying an image of at least two dancers on a screen and controlling the dancers in the displayed image to play various dance performances in accordance with an external operation by a game player to thereby offer a dance game to the game player. The first video dance game apparatus is provided with: an image displaying device having the screen, for displaying the image of the dancers on the screen; a dance music output device for outputting a music signal indicating a dance music; a beat information generating device for generating beat information on the basis of the music signal; a dance performance data memory device for storing a plurality of dance performance data pieces each indicating respective one of the various dance performances; a dance performance data selecting and reading out device for selecting and reading out one of the dance performance data pieces stored in the dance performance data memory device; an image control device for controlling the image displaying device to change the image of the dancers such that the dancers play a dance performance corresponding to the read out dance performance data piece; an operation device by which the external operation is inputted, for operating the dance performance data selecting and reading out device in accordance with the external operation to select and read out the one of the dance performance data pieces, so as to change the dance performance of the dancers on the screen; and a score calculating device for calculating a game score on the basis of a time lag between a read-out timing, which is a timing at which the dance performance data piece is read out by the dance performance data selecting and reading out device in accordance with the external operation, and a generation timing of the beat information, which is a timing at which the beat information is generated by the beat information generating device.

According to the first video dance game apparatus, the image of at least two dancers is displayed on the screen by the image display device, while a music signal indicating a dance music is outputted by the dance music output device. In this condition, the game player operates the operation device, such as button switches, drive levers, a keyboard, a mouse, a joy-stick or the like, and inputs the external operation by the operation device in accordance with this dance music. Then, the dance performance data selecting and reading out device is operated, so that one of the dance performance data pieces stored in the dance performance data memory device is selected and read out by the dance performance data selecting and reading out device. Thus, under the control of the image control device, the image of the dancers is changed by the image displaying device such that the dancers play a dance performance corresponding to the read out dance performance data piece. Namely, the dance performance of one of the dancers in the displayed image is changed in correspondence with the read dance performance data piece. At this time, the dance performance

of another of the dancers in the displayed image is also changed in the similar manner when another game player operates the operation device. In this way, while at least two dancers play dance on the screen, the time lag between the read-out timing in accordance with the external operation by the operation device, and the generation timing of the beat information generated by the beat information generating device on the basis of the music signal, is detected by the score calculating device, and the game score is calculated by the score calculating device on the basis of this detected time lag. Therefore, the game score becomes the higher as the timing at which the game player changes the dance performance by way of the operation device gets the closer to the timing of the beat of the dance music.

The above object of the present invention can be also achieved by a second video dance game apparatus for displaying an image of at least two dancers on a screen and controlling the dancers in the displayed image to play various dance performances in accordance with an external operation by a game player to thereby offer a dance game to the game player. The second video dance game apparatus is provided with: an image displaying device having the screen, for displaying the image of the dancers on the screen; a dance music output device for outputting a music signal indicating a dance music; a beat information generating device for generating beat information on the basis of the music signal; a dance performance data memory device for storing a plurality of dance performance data pieces each indicating respective one of the various dance performances; a dance performance data selecting and reading out device for selecting and reading out one of the dance performance data pieces stored in the dance performance data memory device; an image control device for controlling the image displaying device to change the image of the dancers such that the dancers play a dance performance corresponding to the read out dance performance data piece; an operation device by which the external operation is inputted, for operating the dance performance data selecting and reading out device in accordance with the external operation to select and read out the one of the dance performance data pieces for at least one of the dancers, so as to change the dance performance of the at least one of the dancers on the screen; a read-out control device for controlling the dance performance data selecting and reading out device to select and read out another of the dance performance data pieces for another of the dancers in a predetermined order and at a predetermined timing which are set in advance for the another of the dancers; and a score calculating device for calculating a game score on the basis of a time lag between a read-out timing, which is a timing at which the dance performance data piece is read out by the dance performance data selecting and reading out device in accordance with the external operation, and a generation timing of the beat information, which is a timing at which the beat information is generated by the beat information generating device.

According to the second video dance game apparatus, the image of at least two dancers is displayed on the screen by the image display device, while a music signal indicating a dance music is outputted by the dance music output device. In this condition, the game player operates the operation device, and inputs the external operation by the operation device in accordance with this dance music. Then, the dance performance data selecting and reading out device is operated, so that one of the dance performance data pieces stored in the dance performance data memory device is selected and read out by the dance performance data selecting and reading out device. Thus, under the control of the image control device, the dance performance of one of the dancers in the displayed image is changed in correspondence with the read dance performance data piece. On the other hand, when, under the control of the read-out control device, another of the dance performance data pieces for another of the dancers in the predetermined order and at the predetermined timing is selected and read out by the dance performance data selecting and reading out device, the dance performance of another of the dancers in the displayed image is also changed. In this way, while at least two dancers play dance on the screen, the time lag between the read-out timing in accordance with the external operation by the operation device, and the generation timing of the beat information generated by the beat information generating device on the basis of the music signal, is detected by the score calculating device, and the game score is calculated by the score calculating device on the basis of this detected time lag. Therefore, the game score becomes the higher as the timing at which the game player changes the dance performance by way of the operation device gets the closer to the timing of the beat of the dance music.

According to the above described first or second video dance game apparatus, while the game player can experience a virtual dance, the game player can compete for the musical sense and the artistic sense.

The above object of the present invention can be also achieved by a third video dance game apparatus for displaying an image of at least two dancers on a screen and controlling the dancers in the displayed image to play various dance performances in accordance with an external operation by a game player to thereby offer a dance game to the game player. The third video dance game apparatus is provided with: an image displaying device having the screen, for displaying the image of the dancers on the screen; a dance music output device for outputting a music signal indicating a dance music; a beat information generating device for generating beat information on the basis of the music signal; a dance performance data memory device for storing a plurality of dance performance data pieces each indicating respective one of the various dance performances; a dance performance data selecting and reading out device for selecting and reading out one of the dance performance data pieces stored in the dance performance data memory device; an image control device for controlling the image displaying device to change the image of the dancers such that the dancers play a dance performance corresponding to the read out dance performance data piece; an operation

device by which the external operation is inputted, for operating the dance performance data selecting and reading out device in accordance with the external operation to select and read out the one of the dance performance data pieces, so as to change the dance performance of the dancers on the screen; a judging device for judging a mutual relation between the dancers in the displayed image; a dance performance data selection permitting device for permitting the dance performance data selecting and reading out device to select the one of the dance performance data pieces only from among the dance performance data pieces each indicating such a dance performance that movements of the dancers are interlocked with each other, in case that the judged mutual relation is a predetermined relation; and a score calculating device for calculating a game score on the basis of the read out dance performance data piece in correspondence with the external operation.

According to the third video dance game apparatus, the image of at least two dancers is displayed on the screen by the image display device, while a music signal indicating a dance music is outputted by the dance music output device. In this condition, the game player operates the operation device, such as button switches, drive levers, a keyboard, a mouse, a joy-stick or the like, and inputs the external operation by the operation device in accordance with this dance music. Then, the dance performance data selecting and reading out device is operated, so that one of the dance performance data pieces stored in the dance performance data memory device is selected and read out by the dance performance data selecting and reading out device. Thus, under the control of the image control device, the dance performance of one of the dancers in the displayed image is changed in correspondence with the read dance performance data piece. At this time, the dance performance of another of the dancers in the displayed image is also changed in the similar manner when another game player operates the operation device. In this way, while at least two dancers play dance on the screen, a mutual relation between the dancers in the displayed image is judged by the judging device. In case that the judged mutual relation is a predetermined relation, the dance performance data selecting and reading out device is permitted to select the one of the dance performance data pieces only from among the dance performance data pieces each indicating such a dance performance that movements of the dancers are interlocked with each other, by the dance performance data selection permitting device. Then, the game score is calculated by the score calculating device on the basis of the read out dance performance data piece, which is read out by this permitted dance performance data selecting and reading out device, in correspondence with the external operation. Therefore, the game score becomes the higher as the timing at which the game player changes a combined or pair dance performance for example, by way of the operation device while at least two dancers in the displayed image perform the combined or pair dance performance, gets the closer to the timing of the beat of the dance music.

The above object of the present invention can be also achieved by a fourth video dance game apparatus for displaying an image of at least two dancers on a screen and controlling the dancers in the displayed image to play various dance performances in accordance with an external operation by a game player to thereby offer a dance game to the game player. The fourth video dance game apparatus is provided with: an image displaying device having the screen, for displaying the image of the dancers on the screen; a dance music output device for outputting a music signal indicating a dance music; a beat information generating device for generating beat information on the basis of the music signal; a dance performance data memory device for storing a plurality of dance performance data pieces each indicating respective one of the various dance performances; a dance performance data selecting and reading out device for selecting and reading out one of the dance performance data pieces stored in the dance performance data memory device; an image control device for controlling the image displaying device to change the image of the dancers such that the dancers play a dance performance corresponding to the read out dance performance data piece; an operation device by which the external operation is inputted, for operating the dance performance data selecting and reading out device in accordance with the external operation to select and read out the one of the dance performance data pieces for at least one of the dancers, so as to change the dance performance of the at least one of the dancers on the screen; a read-out control device for controlling the dance performance data selecting and reading out device to select and read out another of the dance performance data pieces for another of the dancers in a predetermined order and at a predetermined timing which are set in advance for the another of the dancers; a judging device for judging a mutual relation between the dancers in the displayed image; a dance performance data selection permitting device for permitting the dance performance data selecting and reading out device to select the one of the dance performance data pieces only from among the dance performance data pieces each indicating such a dance performance that movements of the dancers are interlocked with each other, in case that the judged mutual relation is a predetermined relation; and a score calculating device for calculating a game score on the basis of the read out dance performance data piece in correspondence with the external operation.

According to the fourth video dance game apparatus, the image of at least two dancers is displayed on the screen by the image display device, while a music signal indicating a dance music is outputted by the dance music output device. In this condition, the game player operates the operation device, such as button switches, drive levers, a keyboard, a mouse, a joy-stick or the like, and inputs the external operation by the operation device in accordance with this dance music. Then, the dance performance data selecting and reading out device is operated, so that one of the dance performance data pieces stored in the dance performance data memory device is selected and read out by the dance

performance data selecting and reading out device. Thus, under the control of the image control device, the dance performance of one of the dancers in the displayed image is changed in correspondence with the read dance performance data piece. On the other hand, when, under the control of the read-out control device, another of the dance performance data pieces for another of the dancers in the predetermined order and at the predetermined timing is selected and read out by the dance performance data selecting and reading out device, the dance performance of another of the dancers in the displayed image is also changed. In this way, while at least two dancers play dance on the screen, a mutual relation between the dancers in the displayed image is judged by the judging device. In case that the judged mutual relation is a predetermined relation, the dance performance data selecting and reading out device is permitted to select the one of the dance performance data pieces only from among the dance performance data pieces each indicating such a dance performance that movements of the dancers are interlocked with each other, by the dance performance data selection permitting device. Then, the game score is calculated by the score calculating device on the basis of the read out dance performance data piece, which is read out by this permitted dance performance data selecting and reading out device, in correspondence with the external operation.

According to the above described third or fourth video dance game apparatus, the game player can operate at least two dancers in the displayed image to play a combined or pair dance performance, and can enjoy a more realistic dance competition.

In one aspect of each of the first to fourth video dance game apparatuses of the present invention, the apparatus is further provided with: a time measuring device for measuring time and restricting a time period, during which the external operation is inputted by the operation device, to a predetermined time period; and a time adjusting device for adjusting the predetermined time period on the basis of the game score calculated by the score calculating device.

According to this aspect, the time period, during which the external operation is inputted by the operation device (i.e. the game time period) is restricted to a predetermined time period by the time measuring device. Since this predetermined time period is adjusted by the time adjusting device on the basis of the game score calculated by the score calculating device, as the game player gets the higher score, the longer game time period is given to the game player, for example. Accordingly, the game player can enjoy the longer game time period, and the point may be further added to the game score in such a case.

In another aspect of the first or second video dance game apparatus of the present invention, the score calculating device calculates the game score on the basis of at least one of a selection order of the dance performance data pieces in correspondence with the external operation, a mutual relation between the successively read dance performance data pieces, and a continuity between the successively read dance performance data pieces, in addition to the time lag.

According to this aspect, since the game score is calculated by the score calculating device on the basis of at least one of the selection order, the mutual relation and the continuity in addition to the time lag, the musical sense and/or the artistic sense as for the dance can be reflected onto the video dance game. Accordingly, the enjoyment of the video dance game can be promoted.

In this aspect, the apparatus may be further provided with: a basic movement data memory device for storing a plurality of basic movement data pieces to change the image in various manners respectively such that the dancers perform a predetermined movement in accordance with the outputted dance music when the image of the dancers is not changed in correspondence with the read dance performance data piece; a basic movement level setting device for setting a basic movement level on the basis of at least one of the read-out timing, the selection order, the mutual relation and the continuity between the successively read dance performance data pieces; a basic movement data selecting and reading out device for selecting and reading out one of the basic movement data pieces in accordance with the basic movement level set by the basic movement level setting device; and a basic movement control device for controlling the image displaying device to change the image of the dancers such that the dancers perform the predetermined movement corresponding to the read out basic movement data piece, when the image of the dancers is not changed in correspondence with the read dance performance data piece.

In this case, when the dance performance data piece is read out, the basic movement level is set by the basic movement level setting device on the basis of at least one of the read-out timing, the selection order, the mutual relation and the continuity. Then, one of the basic movement data pieces stored in the basic movement data memory device is selected and read out by the basic movement data selecting and reading out device, in accordance with the basic movement level set by the basic movement level setting device. When the image of the dancers is not changed in correspondence with the read dance performance data piece, under the control of the basic movement control device, the image of the dancers is changed by the image displaying device such that the dancers perform the predetermined movement corresponding to the read out basic movement data piece. Therefore, even when the external operation is not inputted by the operation device, the image of the dancers is changed so as to perform the predetermined movement. Thus, the dance performance can be played in a manner similar to the real dance actions, and the musical sense and/or the artistic sense as for the dance can be reflected onto the predetermined movement of the dancers.

In this aspect also, the apparatus may be further provided with a dance music control device for controlling the dance music output device to change the music signal outputted therefrom in accordance with at least one of the read-

out timing, the selection order, the mutual relation and the continuity between the successively read dance performance data pieces.

In this case, under the control of the dance music control device, the music signal outputted from the dance music output device is changed in accordance with at least one of the read-out timing, the selection order, the mutual relation and the continuity. Therefore, in case of the dance performance having a high musical sense or a high artistic sense as for the dance, if the external operation to play the dance performance excellent in the cooperation between the dancers is inputted by the game player, the dance music excited correspondingly can be outputted, so that the cooperative feeling between the dance and the music can be improved.

In another aspect of the third or fourth video dance game apparatus of the present invention, the judging device judges a mutual positional relation between the dancers in the displayed image, as the mutual relation. And that, the score calculating device calculates the game score on the basis of at least one of a read-out timing, which is a timing at which the dance performance data piece is read out by the dance performance data selecting and reading out device, the mutual positional relation, a selection order of the dance performance data pieces, a mutual relation between the successively read dance performance data pieces, and a continuity between the successively read dance performance data pieces, in correspondence with the external operation.

According to this aspect, the mutual positional relation between the dancers in the displayed image is judged as the mutual relation by the judging device. Then, the game score is calculated by the score calculating device on the basis of at least one of the read-out timing, the mutual positional relation, the selection order, the mutual relation and the continuity, in correspondence with the external operation. Therefore, not only the musical sense and/or the artistic sense as for the dance but also the cooperative sense can be even more reflected onto the video dance game.

In this aspect, the apparatus may be further provided with: a basic movement data memory device for storing a plurality of basic movement data pieces to change the image in various manners respectively such that the dancers perform a predetermined movement in accordance with the outputted dance music when the image of the dancers is not changed in correspondence with the read dance performance data piece; a basic movement level setting device for setting a basic movement level on the basis of at least one of the read-out timing, the mutual positional relation, the selection order, the mutual relation and the continuity between the successively read dance performance data pieces; a basic movement data selecting and reading out device for selecting and reading out one of the basic movement data pieces in accordance with the basic movement level set by the basic movement level setting device; and a basic movement control device for controlling the image displaying device to change the image of the dancers such that the dancers perform the predetermined movement corresponding to the read out basic movement data piece, when the image of the dancers is not changed in correspondence with the read dance performance data piece.

In this case, when the dance performance data piece is read out, the basic movement level is set by the basic movement level setting device on the basis of at least one of the read-out timing, the mutual positional relation, the selection order, the mutual relation and the continuity. Then, one of the basic movement data pieces stored in the basic movement data memory device is selected and read out by the basic movement data selecting and reading out device, in accordance with the basic movement level set by the basic movement level setting device. When the image of the dancers is not changed in correspondence with the read dance performance data piece, under the control of the basic movement control device, the image of the dancers is changed by the image displaying device such that the dancers perform the predetermined movement corresponding to the read out basic movement data piece. Therefore, even when the external operation is not inputted by the operation device, the image of the dancers is changed so as to perform the predetermined movement. Thus, the dance performance can be played in a manner similar to the real dance actions, and the musical sense and/or the artistic sense as for the dance can be reflected onto the predetermined movement of the dancers.

In this aspect also, the apparatus may be further provided with a dance music control device for controlling the dance music output device to change the music signal outputted therefrom in accordance with at least one of the read-out timing, the mutual positional relation, the selection order, the mutual relation and the continuity between the successively read dance performance data pieces.

In this case, under the control of the dance music control device, the music signal outputted from the dance music output device is changed in accordance with at least one of the read-out timing, the mutual positional relation, the selection order, the mutual relation and the continuity. Therefore, in case of the dance performance having a high musical sense or a high artistic sense as for the dance, if the external operation to play the dance performance excellent in the cooperation between the dancers is inputted by the game player, the dance music excited correspondingly can be outputted, so that the cooperative feeling between the dance and the music can be improved.

In another aspect of the first or second video dance game apparatus of the present invention, the apparatus is further provided with a dance music control device for controlling the dance music output device to change the music signal outputted therefrom in accordance with the read-out timing and the generation timing.

According to this aspect, under the control of the dance music control device, the music signal outputted from the dance music output device is changed in accordance with the read-out timing and the generation timing. Therefore, in

case that the external operation to obtain a high game score is inputted by the game player, the dance music excited correspondingly can be outputted, so that the cooperative feeling between the dance and the music can be improved.

In another aspect of the third or fourth video dance game apparatus of the present invention, the apparatus is further provided with a dance music control device for controlling the dance music output device to change the music signal outputted therefrom in accordance with the read dance performance data piece.

According to this aspect, under the control of the dance music control device, the music signal outputted from the dance music output device is changed in accordance with the read dance performance data piece. Therefore, in case that the external operation for the combined or pair dance performance to obtain a high game score is inputted by the game player, the dance music excited correspondingly can be outputted, so that the cooperative feeling between the dance and the music can be improved.

In another aspect of the first or second video dance game apparatus of the present invention, the apparatus is further provided with: a basic movement data memory device for storing a plurality of basic movement data pieces to change the image in various manners respectively such that the dancers perform a predetermined movement in accordance with the outputted dance music when the image of the dancers is not changed in correspondence with the read dance performance data piece; a basic movement level setting device for setting a basic movement level on the basis of the time lag between the read-out timing and the generation timing; a basic movement data selecting and reading out device for selecting and reading out one of the basic movement data pieces in accordance with the basic movement level set by the basic movement level setting device; and a basic movement control device for controlling the image displaying device to change the image of the dancers such that the dancers perform the predetermined movement corresponding to the read out basic movement data piece, when the image of the dancers is not changed in correspondence with the read dance performance data piece.

According to this aspect, when the dance performance data piece is read out, the basic movement level is set by the basic movement level setting device on the basis of the time lag between the read-out timing and the generation timing. Then, one of the basic movement data pieces stored in the basic movement data memory device is selected and read out by the basic movement data selecting and reading out device, in accordance with the basic movement level set by the basic movement level setting device. When the image of the dancers is not changed in correspondence with the read dance performance data piece, under the control of the basic movement control device, the image of the dancers is changed by the image displaying device such that the dancers perform the predetermined movement corresponding to the read out basic movement data piece. Therefore, even when the external operation is not inputted by the operation device, the image of the dancers is changed so as to perform the predetermined movement. Thus, the dance performance can be played in a manner similar to the real dance actions. Further, by setting the basic movement level to the higher level as the external operation to obtain the higher game score is inputted, the predetermined movement after the dance performance based on the external operation becomes the higher performance. Accordingly, the video dance game can be even more improved.

In another aspect of the third or fourth video dance game apparatus of the present invention, the apparatus is further provided with: a basic movement data memory device for storing a plurality of basic movement data pieces to change the image in various manners respectively such that the dancers perform a predetermined movement in accordance with the outputted dance music when the image of the dancers is not changed in correspondence with the read dance performance data piece; a basic movement level setting device for setting a basic movement level on the basis of the read dance performance data piece; a basic movement data selecting and reading out device for selecting and reading out one of the basic movement data pieces in accordance with the basic movement level set by the basic movement level setting device; and a basic movement control device for controlling the image displaying device to change the image of the dancers such that the dancers perform the predetermined movement corresponding to the read out basic movement data piece, when the image of the dancers is not changed in correspondence with the read dance performance data piece.

According to this aspect, when the dance performance data piece is read out, the basic movement level is set by the basic movement level setting device on the basis of the read dance performance data piece. Then, one of the basic movement data pieces stored in the basic movement data memory device is selected and read out by the basic movement data selecting and reading out device, in accordance with the basic movement level set by the basic movement level setting device. When the image of the dancers is not changed in correspondence with the read dance performance data piece, under the control of the basic movement control device, the image of the dancers is changed by the image displaying device such that the dancers perform the predetermined movement corresponding to the read out basic movement data piece. Therefore, even when the external operation is not inputted by the operation device, the image of the dancers is changed so as to perform the predetermined movement. After the external operation for the combined or pair dance performance is inputted and the combined or pair dance performance is played in the displayed image, the dancers in the combined or pair state performs the predetermined movement, so that the dance performance can be played in a manner similar to the real dance actions. Further, by setting the basic movement level to the higher level as the external operation to obtain the higher game score is inputted, the predetermined movement after

the dance performance based on the external operation becomes the higher performance. Accordingly, the video dance game can be even more improved.

In the above mentioned aspects of the first to fourth video dance game apparatuses in which the apparatus is provided with: the basic movement data memory device; the basic movement level setting device; the basic movement data selecting and reading out device; and the basic movement control device, of the present invention, the dance performance data memory device may store a plurality of dance performance data pieces indicating dance performances which movements are different from each other with respect to one kind of dance performance. And that, the dance performance data selecting and reading out device may select and read out one of the dance performance data pieces stored in the dance performance data memory device in accordance with the basic movement level.

According to this aspect, a plurality of dance performance data pieces indicating dance performances which movements are different from each other with respect to one kind of dance performance, are stored in the dance performance data memory device. In operation, one of the dance performance data pieces stored in the dance performance data memory device is selected and read out by the dance performance data selecting and reading out device, in accordance with the basic movement level. Therefore, as the basic movement level is the higher, the dance performance data piece for the dance performance in the higher degree of movement with respect to the same kind of dance performance is selected. Thus, in case that the external operation to obtain a high game score is inputted, not only the predetermined movement when the external operation is not inputted but also the dance performance itself based on the external operation becomes the higher. Therefore, the musical sense and/or the artistic sense as for the dance can be even more reflected onto the video dance game.

Also in the above mentioned aspects of the first to fourth video dance game apparatuses in which the apparatus is provided with: the basic movement data memory device; the basic movement level setting device; the basic movement data selecting and reading out device; and the basic movement control device, of the present invention, the apparatus may be further provided with a dance music control device for controlling the dance music output device to change the music signal outputted therefrom in accordance with the basic movement level.

According to this aspect, under the dance music control device, the music signal outputted from the dance music output device is changed in accordance with the basic movement level. Therefore, in case that the external operation to obtain a high game score is inputted by the game player, not only the predetermined movement when the external operation is not inputted becomes excited, but also the outputted dance music becomes excited correspondingly, so that the cooperative feeling between the dance and the music can be improved.

The above described first video dance game apparatus may be realized by a first program storage device readable by a computer for a video dance game, tangibly embodying a program of instructions executable by the computer to perform method processes for displaying an image of at least two dancers on a screen and controlling the dancers in the displayed image to play various dance performances in accordance with an external operation by a game player to thereby offer a dance game to the game player, the program storage device storing a plurality of dance performance data pieces each indicating respective one of the various dance performances, the computer having an operation device by which the external operation is inputted. The method processes are provided with: displaying the image of the dancers on the screen; outputting a music signal indicating a dance music; generating beat information on the basis of the music signal; selecting and reading out one of the dance performance data pieces stored in the program storage device, in accordance with the external operation when the external operation is inputted by the operation device so as to change the dance performance of the dancers on the screen; changing the image of the dancers on the screen such that the dancers play a dance performance corresponding to the read out dance performance data piece; and calculating a game score on the basis of a time lag between a read-out timing, which is a timing at which the dance performance data piece is read out in accordance with the external operation, and a generation timing of the beat information, which is a timing at which the beat information is generated.

The above described second video dance game apparatus may be realized by a second program storage device readable by a computer for a video dance game, tangibly embodying a program of instructions executable by the computer to perform method processes for displaying an image of at least two dancers on a screen and controlling the dancers in the displayed image to play various dance performances in accordance with an external operation by a game player to thereby offer a dance game to the game player, the program storage device storing a plurality of dance performance data pieces each indicating respective one of the various dance performances, the computer having an operation device by which the external operation is inputted. The method processes are provided with: displaying the image of the dancers on the screen; outputting a music signal indicating a dance music; generating beat information on the basis of the music signal; selecting and reading out one of the dance performance data pieces for at least one of the dancers stored in the program storage device, in accordance with the external operation when the external operation is inputted by the operation device so as to change the dance performance of the at least one of the dancers on the screen; selecting and reading out another of the dance performance data pieces for another of the dancers in a predetermined order and at a predetermined timing which are set in advance for the another of the dancers; changing the image of the dancers on the screen such that the dancers play a dance performance corresponding to the read out

dance performance data piece; and calculating a game score on the basis of a time lag between a read-out timing, which is a timing at which the dance performance data piece is read out in accordance with the external operation, and a generation timing of the beat information, which is a timing at which the beat information is generated.

The above described third video dance game apparatus may be realized by a third program storage device readable by a computer for a video dance game, tangibly embodying a program of instructions executable by the computer to perform method processes for displaying an image of at least two dancers on a screen and controlling the dancers in the displayed image to play various dance performances in accordance with an external operation by a game player to thereby offer a dance game to the game player, the program storage device storing a plurality of dance performance data pieces each indicating respective one of the various dance performances, the computer having an operation device by which the external operation is inputted. The method processes are provided with: displaying the image of the dancers on the screen; outputting a music signal indicating a dance music; generating beat information on the basis of the music signal; selecting and reading out one of the dance performance data pieces stored in the program storage device, in accordance with the external operation when the external operation is inputted by the operation device so as to change the dance performance of the dancers on the screen; changing the image of the dancers on the screen such that the dancers play a dance performance corresponding to the read out dance performance data piece; judging a mutual relation between the dancers in the displayed image; permitting the selecting and reading out process to select the one of the dance performance data pieces only from among the dance performance data pieces each indicating such a dance performance that movements of the dancers are interlocked with each other, in case that the judged mutual relation is a predetermined relation; and calculating a game score on the basis of the read out dance performance data piece in correspondence with the external operation.

The above described fourth video dance game apparatus may be realized by a fourth program storage device readable by a computer for a video dance game, tangibly embodying a program of instructions executable by the computer to perform method processes for displaying an image of at least two dancers on a screen and controlling the dancers in the displayed image to play various dance performances in accordance with an external operation by a game player to thereby offer a dance game to the game player, the program storage device storing a plurality of dance performance data pieces each indicating respective one of the various dance performances, the computer having an operation device by which the external operation is inputted. The method processes are provided with: displaying the image of the dancers on the screen; outputting a music signal indicating a dance music; generating beat information on the basis of the music signal; selecting and reading out one of the dance performance data pieces for at least one of the dancers stored in the program storage device, in accordance with the external operation when the external operation is inputted by the operation device so as to change the dance performance of the at least one of the dancers on the screen; selecting and reading out another of the dance performance data pieces for another of the dancers in a predetermined order and at a predetermined timing which are set in advance for the another of the dancers; changing the image of the dancers on the screen such that the dancers play a dance performance corresponding to the read out dance performance data piece; judging a mutual relation between the dancers in the displayed image; permitting the selecting and reading out process to select the one of the dance performance data pieces only from among the dance performance data pieces each indicating such a dance performance that movements of the dancers are interlocked with each other, in case that the judged mutual relation is a predetermined relation; and calculating a game score on the basis of the read out dance performance data piece in correspondence with the external operation.

According to the first to fourth program storage devices, such as a CD-ROM, a DVD-ROM, a ROM, a floppy disk or the like, of the present invention, the above described first to fourth video dance game apparatuses of the present invention can be respectively realized as the computer for the video dance game reads the dance performance data pieces and the program of instructions from respective one of the first to fourth program storage devices, and executes the read program by use of the read dance performance data pieces.

The first to fourth program storage devices may further store the aforementioned basic movement data pieces to change the image in various manners respectively such that the dancers perform a predetermined movement in accordance with the outputted dance music when the image of the dancers is not changed in correspondence with the read dance performance data piece. Also, the first to fourth program storage devices may further store the aforementioned dance performance data pieces indicating the dance performances which movements are different from each other with respect to one kind of dance performance.

The nature, utility, and further features of this invention will be more clearly apparent from the following detailed description with respect to preferred embodiments of the invention when read in conjunction with the accompanying drawings briefly described below.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a block diagram of a video dance game apparatus as a first embodiment of the present invention;

FIG. 2 is a perspective view of one example of an operation section in the video dance game apparatus of FIG. 1;

FIG. 3 is a flowchart showing one portion of an operation of the first embodiment;

FIG. 4 is a flowchart showing another portion of the operation of the first embodiment;

FIG. 5 is a flowchart showing another portion of the operation of the first embodiment;

FIG. 6 is a flowchart showing another portion of the operation of the first embodiment;

FIG. 7 is a timing chart showing a detection timing of a beat signal in a second embodiment of the present invention;

FIG. 8 is a timing chart showing a relation between dance music data and score ratio data in a fourth embodiment of the present invention;

FIG. 9 is a flowchart showing one portion of an operation of a seventh embodiment of the present invention;

FIG. 10 is a flowchart showing another portion of the operation of the seventh embodiment;

FIG. 11 is a flowchart showing another portion of the operation of the seventh embodiment;

FIG. 12 is a flowchart showing another portion of the operation of the seventh embodiment;

FIG. 13 is a flowchart showing another portion of the operation of the seventh embodiment; and

FIG. 14 is a perspective view of a modified embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Embodiments of the present invention will be now explained, with referring to the accompanying drawings.

[First Embodiment]

At first, a first embodiment is explained with reference to FIGS. 1 to 6. FIG. 1 is a block diagram showing a schematic configuration of a video game apparatus of this embodiment.

In FIG. 1, the video game apparatus is provided with: a CPU (Central Processing Unit) 1, a program/data ROM (Read Only Memory) 2; a data RAM (Random Access Memory) 3; a game sound source 4; a speaker 5; an operation section 6; a polygon parameter memory 7; a polygon data memory 8; a coordinates conversion processing device 9; a polygon paint device 10; a frame memory 11; and a display device 12.

The program/data ROM 2 and the data RAM 3 are connected to the CPU 1 through a communication bus. The CPU 1 runs a program of a game stored in the program/data ROM 2 as one example a program storage device on the basis of the data stored in the data RAM 3. Moreover, the CPU 1 performs calculations such as a coordinates conversion and the like, as described later.

A dance music signal including a beat signal data is outputted from the game sound source 4 as one example of the dance music output device. The game sound source 4 may include a reproducing device such as a CD player, a DVD player or the like to reproduce a music sound from an information record medium such as a CD, a DVD or the like. This beat signal data is inputted to the CPU 1. The CPU 1 detects a timing at an on-beat, on the basis of this beat signal data, and then compares this timing at the on-beat with a timing of a played performance to thereby calculate a score. That is, the CPU 1 functions as one example of the beat information generating device and also one example of the score calculating device.

The operation section 6 as one example of the operation device is provided with a plurality of normal push buttons and/or cross-arranged push buttons disposed on an operation panel of the video game apparatus to thereby set a kind of a performance based on a selection of a pressed push button and a pressed order. Moreover, not only the above mentioned buttons, but also two drive levers 6a and 6b, which can be moved respectively forward and backward as shown in FIG. 2, may be employed, so that the kind of the performance may be set on the basis of the moved direction and the moved amount of the drive levers 6a and 6b. For example, the left drive lever 6a is set so as to operate a left half body of a dancer on a screen of the display device 12, and the right drive lever 6b is set so as to operate a right half body of the dancer on the screen. Then, it is possible to respectively throw down onto this side and a forward side to thereby let the dancer perform a movement on the screen as shown in a TABLE 1. In the TABLE 1, a reference mark "L" denotes the left drive lever 6a, "R" denotes the right drive lever 6b, "↑" denotes an operation that the drive lever 6a or 6b is thrown down onto the forward side, and "↓" denotes an operation that the drive lever 6a or 6b is thrown down onto this side.

TABLE 1

Lever Direction	Movement From Standing Position
L ↑ R ↑	Apply Force Forward
L ↓ R ↓	Apply Force Backward
L ↑ R ↑ L ↓ R ↓	Suddenly Move Weight Backward
L ↓ R ↓ L ↑ R ↑	Suddenly Move Weight Forward
L ↑ R ↓	Right Pivot
L ↓ R ↑ L ↑ R ↓	Right Turn
L ↓ R ↑	Left Pivot
L ↑ R ↓ L ↓ R ↑	Left Turn

In this embodiment, in order to give more reality to the dancer's movement, the dancer, the background and the like are represented by three-dimensional coordinates in the form of a polyhedron, which is a set of polygonal planes. Values of the coordinates in the three-dimensional coordinates frame at each of the vertexes of the polygonal planes are converted into coordinates of a display element having a two-dimensional display plane on the screen of the display device 12. This conversion is carried out for each polygonal plane, and is then displayed on the screen.

Such a polygonal plane is referred to as a "polygon". In this embodiment, the value of the coordinates at each vertex of the polygon of the dancer and the background are stored in the polygon data memory 8 as the polygon data, and are used as fixed physical information within a three-dimensional space.

Position information with respect to two dancers, color information and a coordinates conversion equation related to the position information are stored in the polygon parameter memory 7.

A coordinates conversion processing device 9 as one example of the image control device reads a content stored in the polygon parameter memory 7 to thereby perform a coordinates conversion process for the polygon data, and further performs a coordinates conversion process so as to project the coordinates-converted polygon data in the three-dimensional coordinates frame onto the screen. The polygon paint device 10 as one example of the image displaying device reads a light source parameter from the polygon data memory 8, performs the coloring process and the like for the coordinates-converted polygon data, writes the polygon data to the frame memory 11, and then reads it out after writing all the polygon data to thereby output it to the display device 12.

The data is written to the frame memory 11 in order to determine the order of drawing in consideration with a distance of a deep direction on the screen. That is, it is necessary to register each polygon data in the memory, sort them at a time of drawing, read out in the order of decreasing a length in the deep direction on the screen and then draw them in the frame memory 11.

In the above mentioned configuration, when a game player operates the operation section 6 provided with the drive levers 6a and 6b (in FIG. 2) and the like to thereby change a pose and a position of the dancer, the CPU 1 as one example of the dance performance data selecting and reading out device selects and reads out the position of the dancer and the coordinates conversion equation with regard thereto as the dance performance data, from the program/data ROM 2 as one example of the dance performance data memory device, and momentarily stores the read out position of the dancer and the coordinates conversion equation with regard thereto, into the polygon parameter memory 7. Then, the coordinates conversion processing device 9 reads out the fixed physical information stored in the polygon data memory 8 and the dancer's position and the coordinates conversion equation stored in the polygon parameter memory 7, and then coordinates-converts the fixed physical information, such as the background and the like, with respect to a relatively observing point for the dancer at that time, and further performs the coordinates conversion process so as to project the coordinates-converted polygon data in the three-dimensional coordinates frame onto the screen. The writing operation to the frame memory 11 is carried out by sending the thus-obtained information to the polygon paint device 10. Hence, by reading it out, the substantially three-dimensional image is depicted on the screen of the display device 12.

Next, an operation of the video dance game apparatus of this embodiment having the above mentioned configuration is explained with reference to flowcharts in FIGs. 3 to 6. As shown in the flowchart of FIG. 3, a menu screen is displayed at first (Step S1). Then, a category (genre) of a dance to be competed is selected (Step S2). Each dance is classified on the basis of a kind of a beat signal. When a dance is selected, the selected dance category data is read from the ROM 2 (Step S3), and this is set and stored into the RAM 3 (Step S4). Next, a dancer is selected (Step S5). For each dancer, the level data of a plurality of body feature items is set for each of a personal performance and a com-

bination performance. A score is calculated when the performance is played in accordance with the level data for each of the body feature items.

For example, a level indicating a heavy weight as for a body weight item among the body feature items is set for a dancer A. Thus, if the game player operates so as to play a performance of a jump, a score becomes low. The dancer A is set so as not to take an excessive jump also on the screen. Moreover, a level indicating an excellently speed feeling as for a speed feeling item among the body feature items is set for a dancer B. Thus, if the game player operates so as to consecutively play the performance, the score becomes high.

Then, in a case that any one of the dancers is selected, the selected dancer data is read from the program/data ROM 2 (Step S6), and is set and stored into the data RAM 3 (Step S7).

Next, music data based on the selected dance category data is sent to the game sound source 4 (Step S8), and the dance music is reproduced. A beat signal is also included in the music data. The polygon data with regard to the dancer at the beginning of the game is set in the polygon parameter memory 7 (Step S9). The polygon data with regard to the background at the beginning of the game is read from the polygon data memory 8 (Step S10). Then, the coordinates conversion process is performed by the coordinates conversion processing device 9 (Step S11). The converted polygon data is written into the frame memory 11 by the polygon paint device 10 (Step S12), and is displayed on the display device 12 (Step S13).

Next, as shown in the flowchart of FIG. 4, a competition time counter as one example of the time measuring device is set to a predetermined value (for example, 5 minutes) (Step S14). A remaining time counter is set to a predetermined value (for example, 1 minute) (Step S15). The competition time is a time period during which the dance music is reproduced, and is set in the dance category data. The remaining time is a time period during which the game player can operate the dancer, and is set in such a way that the competition time is longer than the remaining time at the beginning of the game. As described later, since the game player plays the performance for the dancer, a time corresponding to the score is added to the remaining time by the CPU 1 as one example of the time adjusting device, and thereby a time period during which the dancer can be operated is extended. On the other hand, when the dance music is finished because of an expiration of the competition time, the remaining time at that time is converted into the score and is then displayed. When the remaining time is expired while the dance music is reproduced, the game is finished.

In order to execute the above mentioned process, the competition time counter is firstly down-count-driven and the result is displayed (Step S16). The remaining time counter is down-count-driven and the result is displayed (Step S17). Next, it is judged whether or not the remaining time counter is zero (Step S18). If it is zero (Step S18: YES), the game is finished. If it is not zero (Step S18: NO), it is judged whether or not the dance is finished when the competition time counter is zero (Step S19). If it is finished (Step S19: YES), the conversion of the remaining time into the score is carried out from the remaining time counter at that time (Step S20), and this is displayed (Step S21).

If it is not zero (Step S19: NO), the polygon parameter data for the two dancers is changed on the basis of the dance music data, and the changed data is set in the polygon parameter memory 7 (Step S22). The polygon data with regard to the background at that time is read from the polygon data memory 8 (Step S23), and the coordinates conversion process is performed (Step S24). Then, the converted polygon data is written into the frame memory by the polygon paint device 10 (Step S25), and is displayed on the display device 12 (Step S26). That is, such a display that an appropriate dance is performed by moving the image of the two dancers is carried out by the processes at the steps S22 to S26.

Then, the CPU 1 as one example of the position judging device detects a position, a distance and the like in the polygon data of the two dancers, so as to judge the relation between the polygon data of one dancer and the polygon data of the other dancer (Step S27). Then, the CPU 1 judges whether or not it is a timing at which the combination performance can be played (Step S28).

If it is not the timing at which the combination performance can be played (Step S28: NO), as shown in the flowchart of FIG. 5, the CPU 1 judges whether or not a combination lamp for indicating the timing at which the combination performance can be played is displayed (Step S29). If the combination lamp is displayed (Step S29: YES), the display of the combination lamp is extinguished (Step S30). After the step S29 (NO) or S30, the game player operates the operation section 6 so that the displayed dancer plays the performance, and then it is judged whether or not the polygon data for the dancer is changed (Step S31).

If it is not changed (Step S31: NO), the operational flow returns to the step S18 in FIG. 4. In FIG. 5 again, if it is changed (Step S31: YES), the CPU 1 judges the kind of the operated performance (Step S32), and then detects a time lag or shift between the timing when the operation section 6 is operated (i.e., the performance is played) and the timing of the beat signal of the dance music (Step S33). Then, the CPU 1 judges whether or not there is any relation between the previous performance and the present performance when the game player operates to consecutively play the performance, by detecting a relation to the dancer polygon data prior to the operation (Step S34). Then, the CPU 1 judges whether or not there is any continuity between the previous performance and the present performance when the game player operates to consecutively play the performance, by detecting a timing when the operation section 6 is continuously operated (Step S35). Then, the CPU 1 as one example of the score calculating device calculates the score based

on the judgment results at the steps S32 to S35 (Step S36), and calculates the remaining time corresponding to the score to thereby update (add) the remaining time counter (Step S37).

Next, the polygon parameters changed in a similar manner as to the steps S9 to S13 are set in the polygon parameter memory 7 (Step S38). The background polygon data at that time is read from the polygon data memory 8 (Step S39). The coordinates conversion process is performed by the coordinates conversion processing device 9 (Step S40). Then, the processed result is written into the frame memory 11 (Step S41), and is then displayed on the display device 12 (Step S42). That is, by the processes at the steps S29 to S42, the display is carried out so as to play the personal performance such that the performance is played for the dancer whom the game player intends to operate, irrespective of the other dancer.

On the other hand, when judging at the step S28 in FIG. 4 that it is the timing of playing the combination performance (step S28: YES), the combination lamp is displayed as shown in the flow chart of FIG. 6 (Step S43). Then, it is judged whether or not the polygon data of the dancer is changed, as the game player operates the operation section 6 so that the displayed dancer plays the performance (Step S44). If it is not changed (Step S44: NO), the operational flow returns to the step S18 in FIG. 4. Namely, the state in which this combination lamp is displayed is such a state that the CPU 1 as one example of the dance performance data selection permitting device allows the selection of the combination performance, so that, if the polygon data is changed by the operation of the operation section 6 so as to play the combination performance (Step S44: YES), the kind of the operated combination performance is judged (Step S45). Then, a time lag or shift between the timing when the operation section 6 is operated and the timing of the beat signal of the dance music is detected (Step S46). Then, the distance and positional relation between the polygon data of one dancer and the polygon data of the other dancer are detected (Step S47). Next, a time relation between the timing when the performance is played by the dancer whom the game player operates by the operation section 6 so as to move it, and the timing when the performance is played by the other dancer is detected. That is, the time relation (lag) between the changed timings of the polygon data for the two dancers is detected (Step S48).

Next, by detecting the timing when the operation section 6 is continuously operated, it is judged whether or not there is a continuity between the previous performance and the present performance when the game player operates to continuously play the performance (Step S49). Then, the score is calculated on the basis of the judgment results of the steps S45 to S49 (Step S50). The remaining time corresponding to the score is calculated, and the remaining time counter is updated (added) (Step S51).

The processes same as those at the steps S38 to S42 are performed (Steps S52 to S56). In this manner, by the processes at the steps S43 to S56, the display is performed so as to play the combination performance in such a way that a performance is simultaneously played by the dancer whom the game player intends to operate and the other dancer.

As mentioned above, according to the present embodiment, the game player can obtain a high score by playing various dance performances in harmonization with the beat timing of the dance music, and can enjoy a time-extended play based on the score. Thus, it is possible to compete not only for the conventionally simply operational skill but also for a music sense or an art sense with regard to the dance, and thereby possible to realize an enjoyment which has never been experienced before.

Moreover, the combination performance can be played by operating in such a way that the two game players let the two dancers play the dance. Accordingly, the score is affected by not only the time lag or shift with respect to the above mentioned beat timing, but also the time lag or shift between the timings of the dance performances played by the two dancers. Hence, it is possible to enjoy a new game in which the cooperation between the game players is competed, which has never been experienced before.

[Second Embodiment]

Next, a second embodiment of the present invention is explained with reference to FIG. 7. Explanations of the portions common to the first embodiment are omitted.

In the first embodiment, the timing of the on-beat and the timing of the played performance are detected as shown in FIG. 7, and the score is calculated on the basis of the time lag or shift between both of these timings. However, in the second embodiment, a timing of an off-beat and the timing of the played performance are detected as shown in FIG. 7 to thereby calculate the score on the basis of the time lag or shift between both of these timings.

In this manner, since the score can be calculated at any of the beat timings, the appropriate score can be calculated on the basis of the kind of the dance music.

[Third Embodiment]

Next, a third embodiment of the present invention is explained. Explanations of the portions common to the first embodiment are omitted.

In the first embodiment, the case where the two dancers are externally operated by the respective game players is explained. However, in addition to the above mentioned mode, a mode is included in the third embodiment, in which one dancer is externally operated while the other dancer is automatically controlled to play a dance according to a program which is stored in advance by the CPU 1 as one example of the readout control device.

For example, in a case of a social dance in which a step is defined, even one game player can enjoy the game by including such a mode.

[Fourth Embodiment]

Next, a fourth embodiment of the present invention is explained. Explanations of the portions common to the first embodiment are omitted.

In this embodiment, a score is set in accordance with a flow of a dance music. For example, as shown in FIG. 8, the dance music data has score ratio data with respect to a reproduction output of the dance music on a time axis. Then, if a performance is played when the dance music is at the climax, the score is set larger than that of the case where the same performance is played at a time of another reproduction.

For example, even if a certain performance has five points, a ratio is defined as 0.7 for a case that the performance is played when the dance music is not excited. Then, if the performance is played when the dance music is not excited, the score becomes $5 \times 0.7 = 3.5$. On the other hand, the ratio is defined as 1.5 for a case that the dance music is excited. Then, if the performance is played at this time, the score becomes $5 \times 1.5 = 7.5$.

According to this embodiment, the music sense or the art sense is required more and more. Hence, the pleasure of the game can be increased.

[Fifth Embodiment]

Next, a fifth embodiment of the present invention is explained. Explanations of the portions common to the first embodiment are omitted.

The personal performance and the combination performance are preset in the above mentioned embodiments. However, the fifth embodiment has a function of editing a performance, and thereby a game player can prepare a desirable performance by the external operation and set it in advance of actually playing the game. For example, for a certain performance, it is possible to set a dancer's pose before a performance is played by a game player and a dancer's pose after the performance is played. Then, if the operation section 6 is operated to play this performance, it is possible to carry out such a sequential display that the dancer has the pose before the performance is played, the performance is played, and the dance has the pose after the performance is played.

Actually, the image data and the like corresponding to the operation of the operation section 6 may be read out from the program/data ROM 2 by the CPU 1 as one example of the editing device, and may be stored into the data RAM 3 and the like, as the user data, in accordance with the operation of the operation section 6, while the selected pose is displayed on the display device 12 by the polygon paint device 10 and the like.

[Sixth Embodiment]

Next, a sixth embodiment of the present invention is explained. Explanations of the portions common to the first embodiment are omitted.

In the above mentioned embodiments, the information record medium, such as a CD, a DVD or the like installed in the dance game apparatus, may be used as the source of the dance music by the game sound source 4. In the information record medium, the dance music dedicated to the game apparatus is stored, such that not only the music data, but also the score ratio data may be stored in advance.

However, the present invention is not limited to it. Namely, the sixth embodiment is adapted to reproduce a general dance music CD as the information record medium. In this case, it may be provided with an extract device, constructed as one hardware unit or constructed in the CPU 1 according to the computer program, for extracting a beat component from a reproduction signal of the music CD by using a filter and the like.

[Seventh Embodiment]

Next, a seventh embodiment of the present invention is explained with reference to FIGs. 9 to 13. Explanations of the portions common to the first embodiment are omitted.

The seventh embodiment has an idling function of displaying a dynamic picture of a dancer in a basic movement corresponding to a dance music, even if an input operation for the performance is not carried out for the dancer by the operation section 6. The displayed picture on the display device 12 in this idling state is dynamically changed in accord-

ance with the input operation of the performance for the dancer, and the dance music is also dynamically changed.

An operation of the video dance game apparatus in this embodiment is explained with reference to flowcharts in FIGs. 9 to 13. In these flowcharts, same steps as those in the flowcharts of FIGs. 3 to 6 used in the first embodiment carry the same step numbers, and the detailed explanations thereof are omitted.

As shown in FIG. 9, this embodiment is similar to the first embodiment up to the step where the dance category and the dancer are selected and each data is stored into the data RAM 3 (Steps S1 to S7). However, in this embodiment, after that, an idling/music level as a basic movement level is set to "1" by the CPU 1 as one example of the basic movement level setting device (Step S100). This idling/music level is referred to when determining the variation degrees of the dancer's movement and the dance music in the idling state. As the operation by which a higher score can be obtained is carried out, the idling/music level is also set to a higher value.

When a music level is read out by the CPU 1 as one example of the dance music control device, since a first music level is "1" (i.e. a level at the beginning), the music data corresponding to the music level "1" is sent to the game sound source 4 by the CPU 1 as one example of the dance music control device, on the basis of the dance category data (Step S101). When an idling level is similarly read out by the CPU 1 as one example of the basic movement level selecting and reading out device, since the idling level is "1" at first, the basic movement data is read out so as to let the dancer play an idling dynamic picture operation (e.g., stepping of taps) corresponding to the idling level "1". That is, a position of the dancer and a coordinates conversion equation with regard thereto as the basic movement data are selected and read out from the program/data ROM 2 as one example of the basic movement data memory device, by the CPU 1 as one example of the basic movement level selecting and reading out device, and then the position of the read out dancer and the coordinates conversion equation with regard thereto are set and stored into the polygon parameter memory 7 (Step S102). Moreover, the polygon data with regard to the background corresponding to the idling/music level "1" is read out from the polygon data memory 8 (Step S103). Then, the coordinates conversion process is performed by the coordinates conversion processing device 9 as one example of the basic movement control device similarly to the first embodiment (Step S11). The converted polygon data is written into the frame memory 11 by the polygon paint device 10 (Step S12), and is then displayed on the display device 12 (Step S13). Thanks to the above mentioned processes, even if the external input is not carried out from the operation section 6, the dancer in the idling state can be moved in harmonization with the beat of the dance music. Hence, it is possible to really represent the dancer's movement.

As shown in FIG. 10, after the competition time counter and the remaining time counter are set similarly to the first embodiment (Steps S14 to S15), the competition time counter and the remaining time counter are driven and displayed (Steps S16 to S17). Then, while it is judged whether or not the remaining time counter and the competition time counter become zero (Steps S18 to S19), the operational flow is in a waiting state for an input request of the dance performance data.

The waiting state for the input request of the dance performance data while counting the time as mentioned above is similar to the first embodiment. However, in this embodiment, even if the dance performance data is not inputted, the dancer's pose and the dance music are dynamically changed on the basis of the idling/music level. Moreover, the value of the idling/music level is also changed.

That is, if the values of the remaining time counter and the competition time counter are not zero (Step S18 ; NO, Step S19; NO), it is judged by the CPU 1 as one example of the basic movement control device whether or not a predetermined time (for example, 30 seconds) is elapsed after that (Step S104). If it is elapsed (Step S104: YES), it is judged whether or not the idling/music level is the lowest level (Step S105). Then, if the predetermined time is elapsed when it is "1" indicating the lowest level (Step S104 ; YES, Step S105; YES), the game is finished.

However, if it does not become the highest level even after the elapse of the predetermined time (Step S105 ; NO), after the process of reducing the idling/music level by "1" is carried out by the CPU 1 as one example of the basic movement level setting device (Step S106), or if the predetermined time is not elapsed (Step S104 ; NO), the operational flow proceeds to the processes of the music data and the display data shown in FIG. 11, while the idling/music level is maintained at the original state.

Then, as shown in FIG. 11, the music data corresponding to the music level is sent to the game sound source 4 by the CPU 1 as one example of the dance music control device (Step S107). Moreover, the polygon data of the two dancers is changed by the CPU 1 as one example of the basic movement level selecting and reading out device, on the basis of the idling level, and is then set into the polygon parameter memory 7 (Step S108). Further, similarly to the first embodiment, the polygon data with regard to the background at this time is read from the polygon data memory 8 (Step S23). The coordinates conversion process is performed (Step S24). The converted polygon data is written into the frame memory 11 by the polygon paint device 10 (Step S25), and is then displayed on the display device 12 (Step S26).

The idling/music level becomes gradually lower, if the dance performance data is not inputted within the predetermined time period, by carrying out the above mentioned processes, so that the dancer's movement and the dance music are changed into poor levels. Actually, the movement in the idling operation of the dancer becomes smaller, and the level of the dance music becomes lower, or the music becomes darker. Incidentally, although the predetermined time period is also measured by the counter, a value of the counter is set to an original value each time the external

input is carried out.

After that, it is judged whether or not the idling/music level is the highest level (Step S109). If it is the highest level (Step S109; YES), the position, the distance and the like of the two dancers are detected by the CPU 1 as one example of the position judging device, similarly to the first embodiment (Step S27). Then, it is judged whether or not it is the timing when the combination performance can be played (Step S28). In this way, the combination performance can be played only when the idling/music level is the highest level, in this embodiment.

If it is not the timing when the combination performance can be played (Step S28; NO), the process for the combination lamp is performed similarly to the first embodiment (Steps S29 to S30). After that, the score calculation when the dance performance is played by the external input and the like are performed (Steps S31 to S37).

After these processes, the display process is carried out in the first embodiment. However, in the seventh embodiment, prior to the display process, the idling/music level is calculated by the CPU 1 as one example of the basic movement level setting device, as shown in FIG. 12 (Step S110). This calculation is carried out in accordance with the process of judging the kind of the performance (Step S32) and the process of judging the time lag or shift between the timing when the performance is played and the beat (Step S33). For example, if it is not in harmonization with the beat, the level is set lower. If it is in harmonization with the beat or if it is a case of a higher performance, the level is set higher. In this embodiment, when the level is set lower, it is decreased by "1". When the level is set higher, it is increased by not less than "1".

Then, it is judged whether or not the level is to be set lower after this calculation (Step S111). If the level is to be set lower (Step S111; YES), it is judged whether or not a level prior to the setting is the lowest level (Step S112). If it is the lowest level (Step S112: YES), since the level becomes zero, the game is finished.

On the other hand, if the level is not to be set lower (Step S111; NO), it is judged whether or not the level is to be set higher (Step S113). If the level is to be set higher (Step S113; YES), it is judged whether or not a level prior to the setting is the highest level (Step S114). If it is the highest level (Step S114: YES), the level is not set higher, and the highest level is maintained (Step S115).

On the other hand, if the level is to be set lower (Step S111: YES and Step S112: NO), or if the level is to be set higher (Step S113: YES and Step S114: NO), or if the level is to be maintained at its original state (Step S113: NO), the process of setting the idling/music level is carried out (Step S116). After the step S115 (i.e., if the level prior to the setting is the highest level even when the level is to be set higher, and the process of maintaining at the highest level (Step S115) is carried out) or S116, the music data corresponding to the set music level is sent to the sound source 4 by the CPU 1 as one example of the dance music control device (Step S117). In order that the dance performance corresponding to the idling level is displayed by the CPU 1 as one example of the dance performance data selecting and reading out device, the dancer's position and the coordinates conversion equation with regard thereto as the dance performance data are selected and read out from the program/data ROM 2. Then, the read out dancer's position and the coordinates conversion equation with regard thereto are set and stored into the polygon parameter memory 7 (Step S118). Then, the display process is carried out similarly to the first embodiment (Steps S39 to S42).

That is, in this embodiment, not only the score and the value of the remaining time counter are changed on the basis of the kind and the played timing of the dance performance, but also the idling/music level is changed. Moreover, even if the same dance performance is selected by the same operation, the dancer's movement and the music condition are differentiated on the basis of the idling/music level.

For example, in a case that an operation for enabling the dancer to jump is carried out, if the idling/music level is high, the dancer jumps high, or if the idling/music level is low, the dancer jumps low. Moreover, the higher is the idling/music level, the more gorgeous (the more excited) the dance music is. For example, as the idling/music level becomes higher, tones of the various instruments are added, and/or the sound volume is turned up.

After the dance performance is displayed in accordance with the external input process by the change of the polygon parameter and the display process as mentioned above, the operational display of the idling state corresponding to the idling state is carried out so as to follow the dance music, as shown in FIGs. 10 to 11. Then, the dance music corresponding to the music level is played (Steps S104 to S26).

On the other hand, in a case of the played timing of the combination performance at the step S28 shown in FIG. 11 (Step S28; YES), the display process of the combination lamp (Step S43) is carried out as shown in FIG. 13. After that, it is judged whether or not the external input is carried out (Step S44). If the external input is carried out (Step S44: YES), the score is calculated from the kind and the timing of the dance performance similarly to the first embodiment, and the remaining time counter is updated (Steps S45 to S51). In this embodiment, the idling/music level is further calculated from the kind and the timing of the dance performance at that time, by the CPU 1 as one example of the basic movement level setting device (Step S119). If the level is to be set lower (Step S120; YES), after the idling/music level is set lower (Step S121), or if the level is not to be set lower (Step S120: NO), the operational flow proceeds to the next processes of the music data and the display data, while the idling/music level is maintained at the original state. When the idling/music level is already in the highest level and it is to be set higher by "1", it is maintained at the highest level.

The music data corresponding to the music level set by the CPU 1 as one example of the dance music control

device is sent to the sound source 4 (Step S122). The polygon parameter is changed by the CPU 1 as one example of the dance performance data selecting and reading out device so as to display the dance performance corresponding to the idling level, and is set in the polygon parameter memory 7 (Step S123). Then, the display process is carried out similarly to the first embodiment (Steps S53 to S56).

As mentioned above, not only the score and the value of the remaining time counter are changed on the basis of the kind and the timing of the dance performance, but also the idling/music level is changed, even in a case of the combination performance in this embodiment. Moreover, even if the same dance performance is selected by the same operation, the dancer's movement and the music condition are differentiated on the basis of the idling/music level. Furthermore, the dancer in the idling state carries out the idling operation in the state where the combination performance can be played.

As mentioned above, according to the present invention, the basic movement in harmonization with the music for the dancer is automatically carried out on the basis of the idling level. Hence, it is possible to implement the more real presentation. Moreover, the movement in the idling state is dynamically changed on the basis of the kind and the timing of the dance performance. Thus, the dynamically idling operation corresponds to the more dynamic dance. In a case of an undesirable dance or if it is difficult to play the dance in harmonization with the rhythm, the idling operation becomes gradually small. Hence, since the music sense or the art or cooperative feeling with regard to the dance can be reflected in the game, it is possible to improve the game feature.

As the operation in the idling state, the stepping of the taps is considered in this embodiment. However, the present invention is not limited to it. Then, it is possible to move in upper and lower directions or left and right directions. Or, the operation in the idling state may be selected by the input operation from the operation section 6.

According to the present embodiment, the music is changed on the basis of the dancer's movement as well as the exciting degree of the dance. When the dance is excited, or when a high-degree dance pose is carried out, the sound excited in conjunction therewith is played. Hence, the game player can create the entertainment in which the dance and the music are integrated with each other by the dancer's operation.

It is the most desirable implementation to change the dancer's movement and the music in the idling state, as described in this embodiment. However, the present invention is not limited to it. It is possible to apply any one of them to the first embodiment and the like to thereby improve the entertainment feature.

Further, the implementation of this embodiment may be combined with the implementations of the second to sixth embodiments.

The case where the present invention is applied to the video game apparatus is explained in the above mentioned first to seventh embodiments. However, the present invention is not limited to them.

For example, as shown in FIG. 14, the present embodiment can be realized as a modified embodiment provided with a personal computer 1a as one example of the computer for the video dance game and an information record medium 2a, such as a CD-ROM, a DVD-ROM or the like as one example of the program storage device readable by the computer.

In this embodiment, the video dance game indicated by the above explained flow charts of FIGs. 3 to 6 and 9 to 13 in the first to seventh embodiments is mainly performed by a CPU, a memory, a display unit and an audio unit of the personal computer 1a. The control program corresponding to any one of the above explained flow charts of the embodiments is stored in the information record medium 2a in advance, and is read out therefrom through a reading device, such as a CD-ROM drive, a DVD-ROM drive or the like of the personal computer 1a, as the occasion demands. In addition, the information record medium 2a may store the video and audio data for the video dance game, such as the dance performance data, the dance music data and so on, in addition to the control program.

In this manner, the information record medium 2a as one example of the program storage device, tangibly embodies a program of instructions executable by the personal computer 1a to perform method processes for displaying the image of the dancers on the display unit of the personal computer 1a, and controlling the dancers in the displayed image to play various dance performances in accordance with the external operation through a key board, a mouse, a joy stick etc. of the personal computer 1a.

The control program or the video or audio data read from the information record medium 2a may be stored in a RAM in the personal computer 1a, so as to speedily execute the program. Alternatively, the control program may be stored in a ROM of the personal computer 1a in advance, or may be received through a wire or wireless communication line by use of a modem of the personal computer 1a and is stored into the RAM of the personal computer 1a.

In the above embodiments, the two dancers are displayed on the screen. However, it is allowable to display more than two dancers to thereby carry out the dance competition.

Claims

1. A video dance game apparatus for displaying an image of at least two dancers on a screen and controlling the dancers in the displayed image to play various dance performances in accordance with an external operation to

thereby offer a dance game, characterized in that said video dance game apparatus comprises:

an image displaying device (10, 11, 12) having the screen, for displaying the image of the dancers on the screen;
 5 a dance music output device (4, 5) for outputting a music signal indicating a dance music;
 a beat information generating device (1) for generating beat information on the basis of the music signal;
 a dance performance data memory device (2) for storing a plurality of dance performance data pieces each indicating respective one of the various dance performances;
 10 a dance performance data selecting and reading out device (1) for selecting and reading out one of the dance performance data pieces stored in said dance performance data memory device;
 an image control device (1, 7, 8, 9) for controlling said image displaying device to change the image of the dancers such that the dancers play a dance performance corresponding to the read out dance performance data piece;
 15 an operation device (6) by which the external operation is inputted, for operating said dance performance data selecting and reading out device in accordance with the external operation to select and read out said one of the dance performance data pieces, so as to change the dance performance of the dancers on the screen; and
 a score calculating device (1) for calculating a game score on the basis of a time lag between a read-out timing, which is a timing at which the dance performance data piece is read out by said dance performance data selecting and reading out device in accordance with the external operation, and a generation timing of the beat information, which is a timing at which the beat information is generated by said beat information generating device.
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2. A video dance game apparatus for displaying an image of at least two dancers on a screen and controlling the dancers in the displayed image to play various dance performances in accordance with an external operation to thereby offer a dance game, characterized in that said video dance game apparatus comprises:

an image displaying device (10, 11, 12) having the screen, for displaying the image of the dancers on the screen;
 30 a dance music output device (4, 5) for outputting a music signal indicating a dance music;
 a beat information generating device (1) for generating beat information on the basis of the music signal;
 a dance performance data memory device (2) for storing a plurality of dance performance data pieces each indicating respective one of the various dance performances;
 a dance performance data selecting and reading out device (1) for selecting and reading out one of the dance performance data pieces stored in said dance performance data memory device;
 35 an image control device (1, 7, 8, 9) for controlling said image displaying device to change the image of the dancers such that the dancers play a dance performance corresponding to the read out dance performance data piece;
 an operation device (6) by which the external operation is inputted, for operating said dance performance data selecting and reading out device in accordance with the external operation to select and read out said one of the dance performance data pieces for at least one of the dancers, so as to change the dance performance of said at least one of the dancers on the screen;
 40 a read-out control device (1) for controlling said dance performance data selecting and reading out device to select and read out another of the dance performance data pieces for another of the dancers in a predetermined order and at a predetermined timing which are set in advance for said another of the dancers; and
 45 a score calculating device (1) for calculating a game score on the basis of a time lag between a read-out timing, which is a timing at which the dance performance data piece is read out by said dance performance data selecting and reading out device in accordance with the external operation, and a generation timing of the beat information, which is a timing at which the beat information is generated by said beat information generating device.
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3. A video dance game apparatus for displaying an image of at least two dancers on a screen and controlling the dancers in the displayed image to play various dance performances in accordance with an external operation to thereby offer a dance game, characterized in that said video dance game apparatus comprises:

55 an image displaying device (10, 11, 12) having the screen, for displaying the image of the dancers on the screen;
 a dance music output device (4, 5) for outputting a music signal indicating a dance music;
 a beat information generating device (1) for generating beat information on the basis of the music signal;

a dance performance data memory device (2) for storing a plurality of dance performance data pieces each indicating respective one of the various dance performances;

a dance performance data selecting and reading out device (1) for selecting and reading out one of the dance performance data pieces stored in said dance performance data memory device;

an image control device (1, 7, 8, 9) for controlling said image displaying device to change the image of the dancers such that the dancers play a dance performance corresponding to the read out dance performance data piece;

an operation device (6) by which the external operation is inputted, for operating said dance performance data selecting and reading out device in accordance with the external operation to select and read out said one of the dance performance data pieces, so as to change the dance performance of the dancers on the screen;

a judging device (1) for judging a mutual relation between the dancers in the displayed image;

a dance performance data selection permitting device (1) for permitting said dance performance data selecting and reading out device to select said one of the dance performance data pieces only from among the dance performance data pieces each indicating such a dance performance that movements of the dancers are interlocked with each other, in case that the judged mutual relation is a predetermined relation; and

a score calculating device (1) for calculating a game score on the basis of the read out dance performance data piece in correspondence with the external operation.

4. A video dance game apparatus for displaying an image of at least two dancers on a screen and controlling the dancers in the displayed image to play various dance performances in accordance with an external operation to thereby offer a dance game, characterized in that said video dance game apparatus comprises:

an image displaying device (10, 11, 12) having the screen, for displaying the image of the dancers on the screen;

a dance music output device (4, 5) for outputting a music signal indicating a dance music;

a beat information generating device (1) for generating beat information on the basis of the music signal;

a dance performance data memory device (2) for storing a plurality of dance performance data pieces each indicating respective one of the various dance performances;

a dance performance data selecting and reading out device (1) for selecting and reading out one of the dance performance data pieces stored in said dance performance data memory device;

an image control device (1, 7, 8, 9) for controlling said image displaying device to change the image of the dancers such that the dancers play a dance performance corresponding to the read out dance performance data piece;

an operation device (6) by which the external operation is inputted, for operating said dance performance data selecting and reading out device in accordance with the external operation to select and read out said one of the dance performance data pieces for at least one of the dancers, so as to change the dance performance of said at least one of the dancers on the screen;

a read-out control device (1) for controlling said dance performance data selecting and reading out device to select and read out another of the dance performance data pieces for another of the dancers in a predetermined order and at a predetermined timing which are set in advance for said another of the dancers;

a judging device (1) for judging a mutual relation between the dancers in the displayed image;

a dance performance data selection permitting device (1) for permitting said dance performance data selecting and reading out device to select said one of the dance performance data pieces only from among the dance performance data pieces each indicating such a dance performance that movements of the dancers are interlocked with each other, in case that the judged mutual relation is a predetermined relation; and

a score calculating device (1) for calculating a game score on the basis of the read out dance performance data piece in correspondence with the external operation.

5. A video dance game apparatus according to any one of claims 1 to 4, characterized in that said video dance game apparatus further comprises:

a time measuring device (1) for measuring time and restricting a time period, during which the external operation is inputted by said operation device (6), to a predetermined time period; and

a time adjusting device (1) for adjusting the predetermined time period on the basis of the game score calculated by said score calculating device (1).

6. A video dance game apparatus according to claim 1 or 2, characterized in that said score calculating device (1) calculates the game score on the basis of at least one of a selection order of the dance performance data pieces in

correspondence with the external operation, a mutual relation between the successively read dance performance data pieces, and a continuity between the successively read dance performance data pieces, in addition to the time lag.

- 5 7. A video dance game apparatus according to claim 6, characterized in that said video dance game apparatus further comprises:

a basic movement data memory device (2) for storing a plurality of basic movement data pieces to change the image in various manners respectively such that the dancers perform a predetermined movement in accordance with the outputted dance music when the image of the dancers is not changed in correspondence with the read dance performance data piece;

a basic movement level setting device (1) for setting a basic movement level on the basis of at least one of the read-out timing, the selection order, the mutual relation and the continuity between the successively read dance performance data pieces;

a basic movement data selecting and reading out device (1) for selecting and reading out one of the basic movement data pieces in accordance with the basic movement level set by said basic movement level setting device; and

a basic movement control device (1, 7, 8, 9) for controlling said image displaying device (10, 11, 12) to change the image of the dancers such that the dancers perform the predetermined movement corresponding to the read out basic movement data piece, when the image of the dancers is not changed in correspondence with the read dance performance data piece.

8. A video dance game apparatus according to claim 6, characterized in that said video dance game apparatus further comprises a dance music control device (1) for controlling said dance music output device (4, 5) to change the music signal outputted therefrom in accordance with at least one of the read-out timing, the selection order, the mutual relation and the continuity between the successively read dance performance data pieces.

9. A video dance game apparatus according to claim 3 or 4, characterized in that:

said judging device (1) judges a mutual positional relation between the dancers in the displayed image, as the mutual relation; and

said score calculating device (1) calculates the game score on the basis of at least one of a read-out timing, which is a timing at which the dance performance data piece is read out by said dance performance data selecting and reading out device (1), the mutual positional relation, a selection order of the dance performance data pieces, a mutual relation between the successively read dance performance data pieces, and a continuity between the successively read dance performance data pieces, in correspondence with the external operation.

10. A video dance game apparatus according to claim 9, characterized in that said video dance game apparatus further comprises:

a basic movement data memory device (2) for storing a plurality of basic movement data pieces to change the image in various manners respectively such that the dancers perform a predetermined movement in accordance with the outputted dance music when the image of the dancers is not changed in correspondence with the read dance performance data piece;

a basic movement level setting device (1) for setting a basic movement level on the basis of at least one of the read-out timing, the mutual positional relation, the selection order, the mutual relation and the continuity between the successively read dance performance data pieces;

a basic movement data selecting and reading out device (1) for selecting and reading out one of the basic movement data pieces in accordance with the basic movement level set by said basic movement level setting device (1); and

a basic movement control device (1, 7, 8, 9) for controlling said image displaying device (10, 11, 12) to change the image of the dancers such that the dancers perform the predetermined movement corresponding to the read out basic movement data piece, when the image of the dancers is not changed in correspondence with the read dance performance data piece.

11. A video dance game apparatus according to claim 9, characterized in that said video dance game apparatus further comprises a dance music control device (1) for controlling said dance music output device (4, 5) to change the music signal outputted therefrom in accordance with at least one of the read-out timing, the mutual positional rela-

tion, the selection order, the mutual relation and the continuity between the successively read dance performance data pieces.

12. A video dance game apparatus according to claim 1 or 2, characterized in that said video dance game apparatus further comprises a dance music control device (1) for controlling said dance music output device (4, 5) to change the music signal outputted therefrom in accordance with the read-out timing and the generation timing.

13. A video dance game apparatus according to claim 3 or 4, characterized in that said video dance game apparatus further comprises a dance music control device (1) for controlling said dance music output device (4, 5) to change the music signal outputted therefrom in accordance with the read dance performance data piece.

14. A video dance game apparatus according to claim 1 or 2, characterized in that said video dance game apparatus further comprises:

a basic movement data memory device (2) for storing a plurality of basic movement data pieces to change the image in various manners respectively such that the dancers perform a predetermined movement in accordance with the outputted dance music when the image of the dancers is not changed in correspondence with the read dance performance data piece;

a basic movement level setting device (1) for setting a basic movement level on the basis of the time lag between the read-out timing and the generation timing;

a basic movement data selecting and reading out device (1) for selecting and reading out one of the basic movement data pieces in accordance with the basic movement level set by said basic movement level setting device; and

a basic movement control device (1, 7, 8, 9) for controlling said image displaying device (10, 11, 12) to change the image of the dancers such that the dancers perform the predetermined movement corresponding to the read out basic movement data piece, when the image of the dancers is not changed in correspondence with the read dance performance data piece.

15. A video dance game apparatus according to claim 3 or 4, characterized in that said video dance game apparatus further comprises:

a basic movement data memory device (2) for storing a plurality of basic movement data pieces to change the image in various manners respectively such that the dancers perform a predetermined movement in accordance with the outputted dance music when the image of the dancers is not changed in correspondence with the read dance performance data piece;

a basic movement level setting device (1) for setting a basic movement level on the basis of the read dance performance data piece;

a basic movement data selecting and reading out device (1) for selecting and reading out one of the basic movement data pieces in accordance with the basic movement level set by said basic movement level setting device; and

a basic movement control device (1, 7, 8, 9) for controlling said image displaying device (10, 11, 12) to change the image of the dancers such that the dancers perform the predetermined movement corresponding to the read out basic movement data piece, when the image of the dancers is not changed in correspondence with the read dance performance data piece.

16. A video dance game apparatus according to claim 14 or 15, characterized in that:

said dance performance data memory device (2) stores a plurality of dance performance data pieces indicating dance performances which movements are different from each other with respect to one kind of dance performance; and

said dance performance data selecting and reading out device (1) selects and reads out one of the dance performance data pieces stored in said dance performance data memory device in accordance with the basic movement level.

17. A video dance game apparatus according to any one of claims 14 to 16, characterized in that said video dance game apparatus further comprises a dance music control device (1) for controlling said dance music output device (4, 5) to change the music signal outputted therefrom in accordance with the basic movement level.

FIG. 1

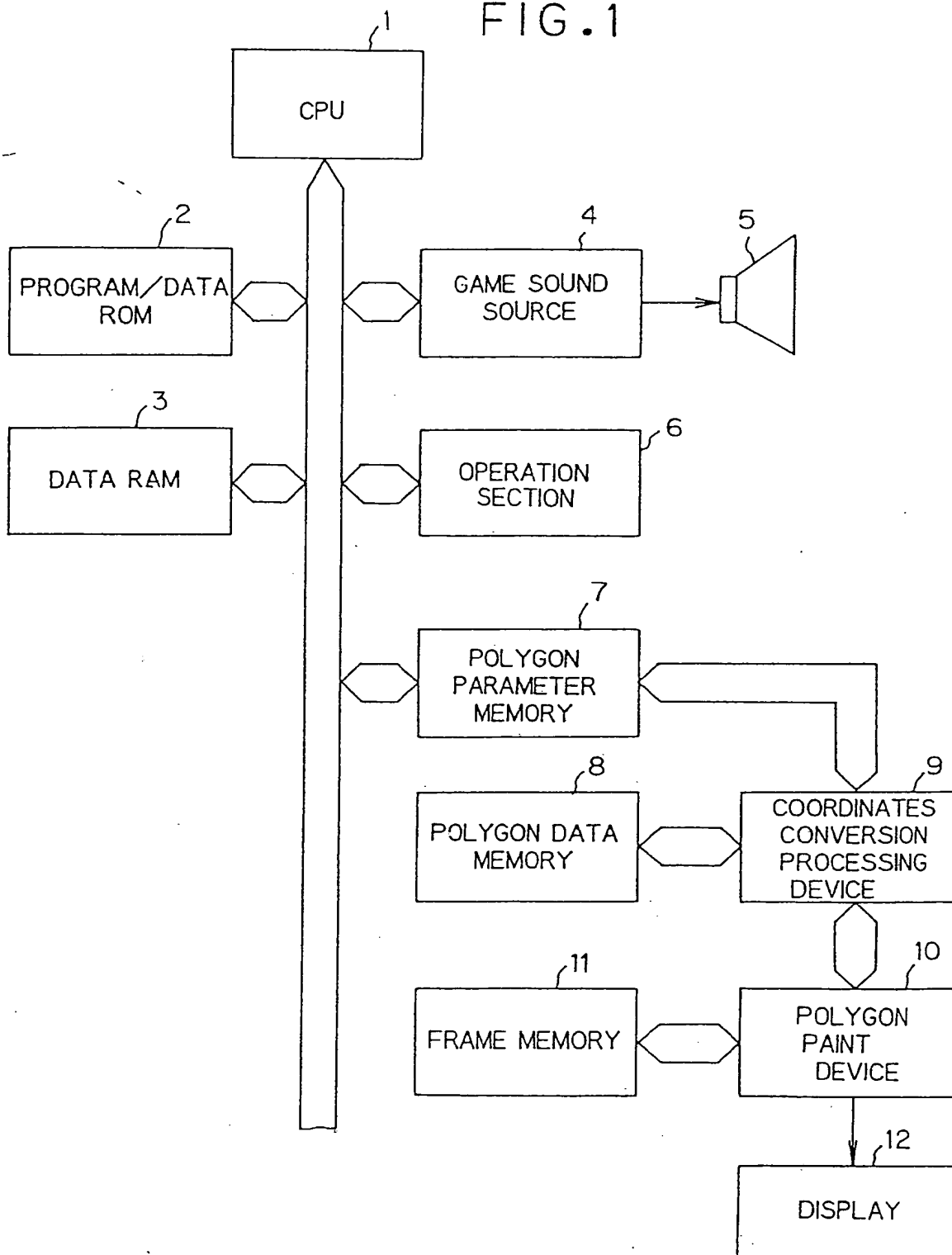


FIG.2

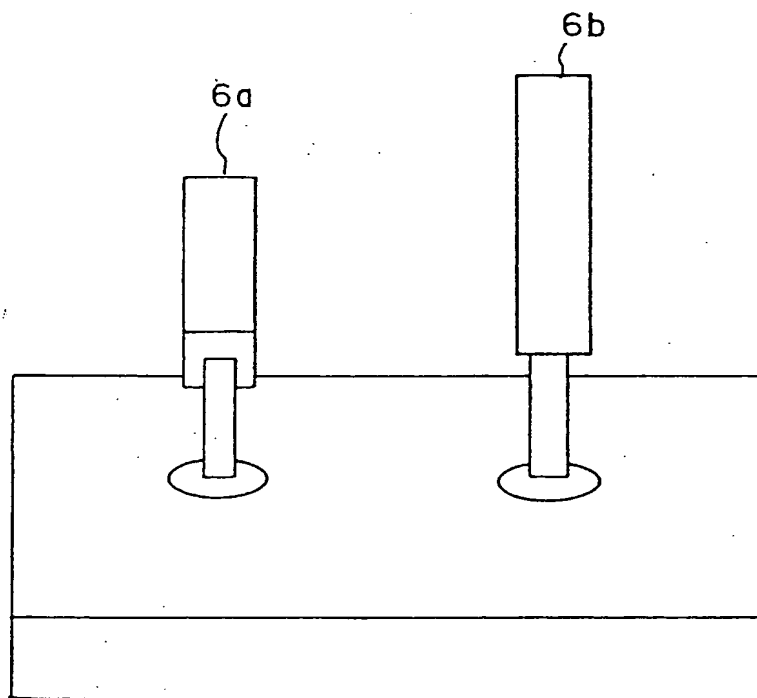


FIG. 3

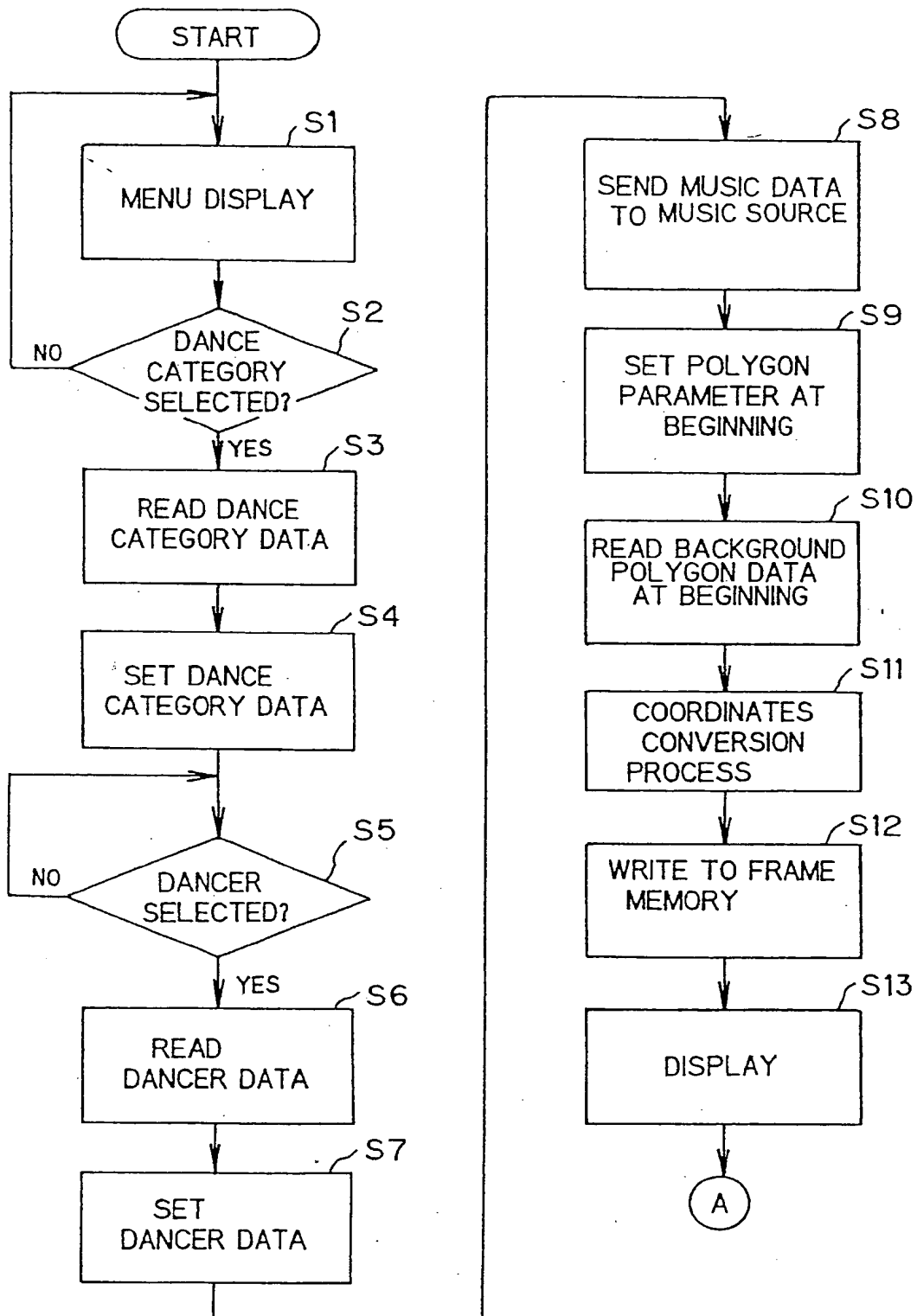


FIG. 4

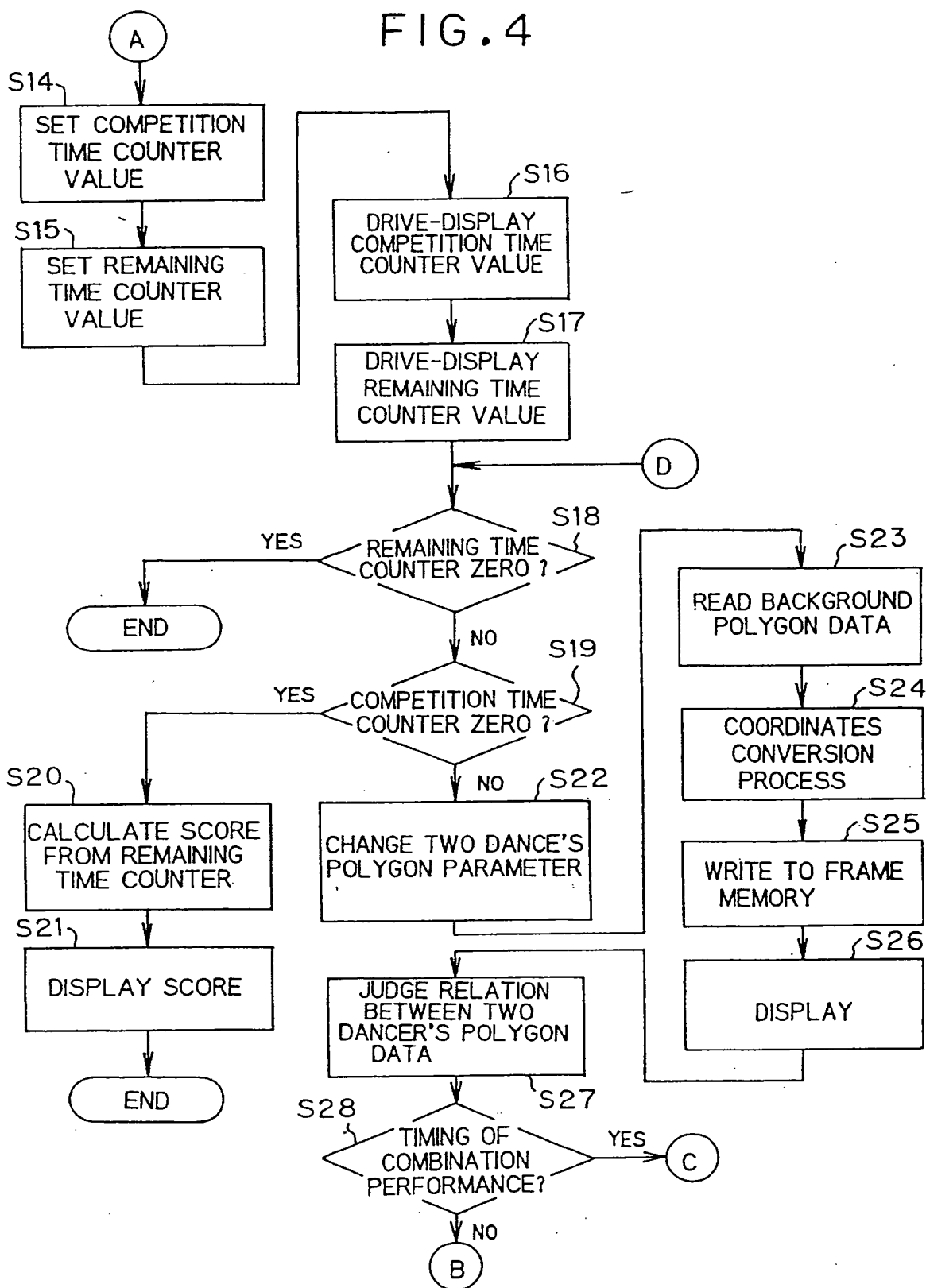


FIG. 5

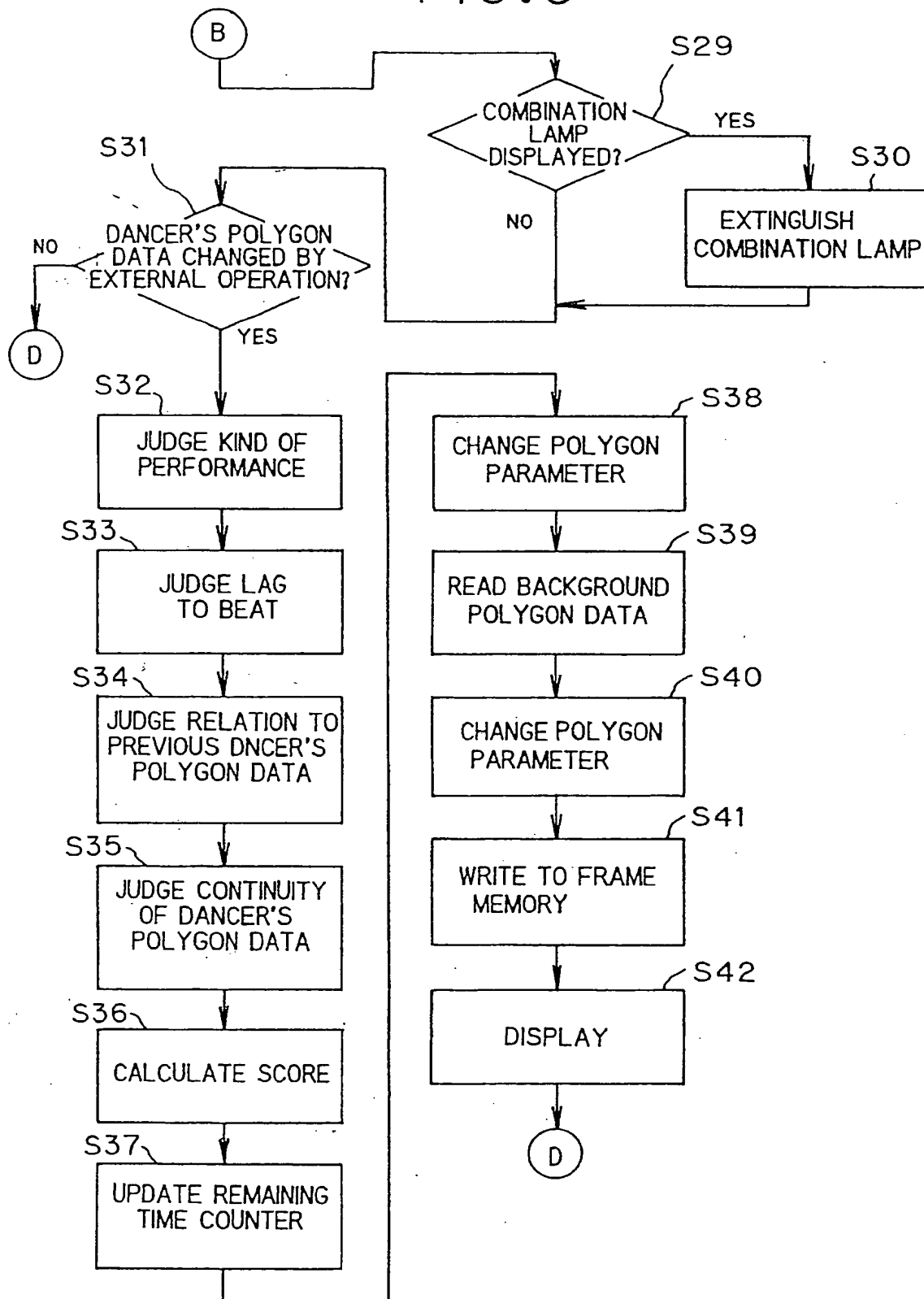


FIG. 6

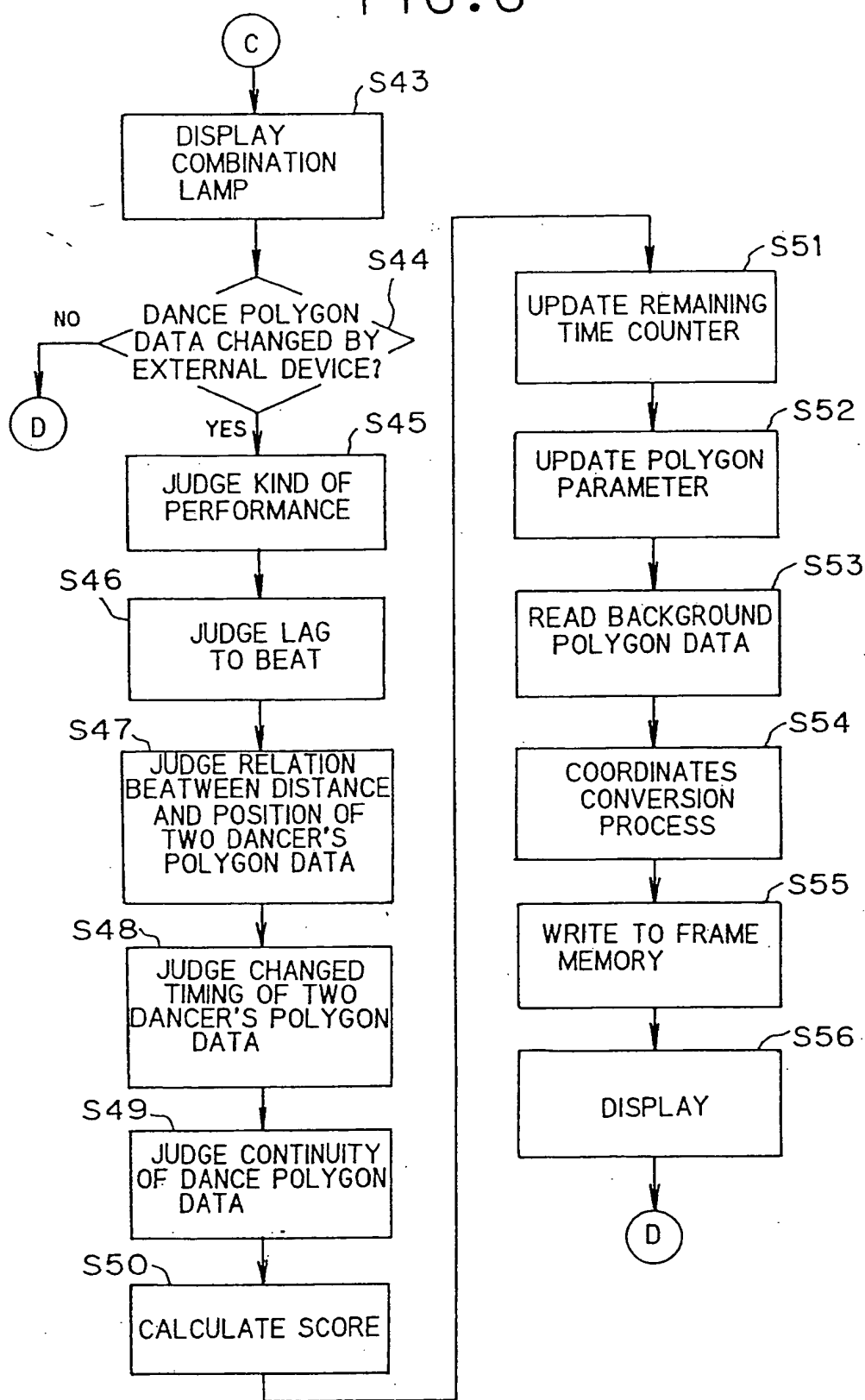


FIG. 7

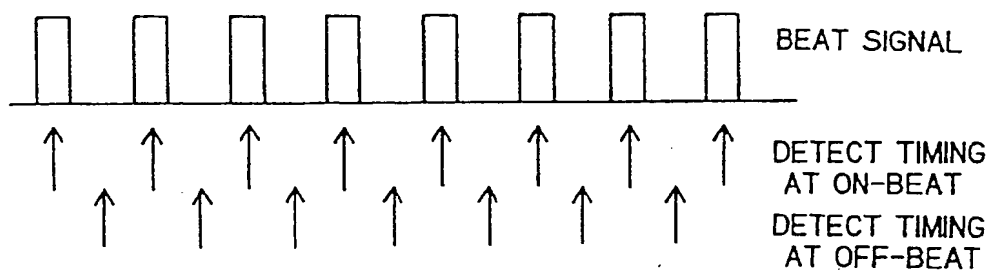


FIG. 8

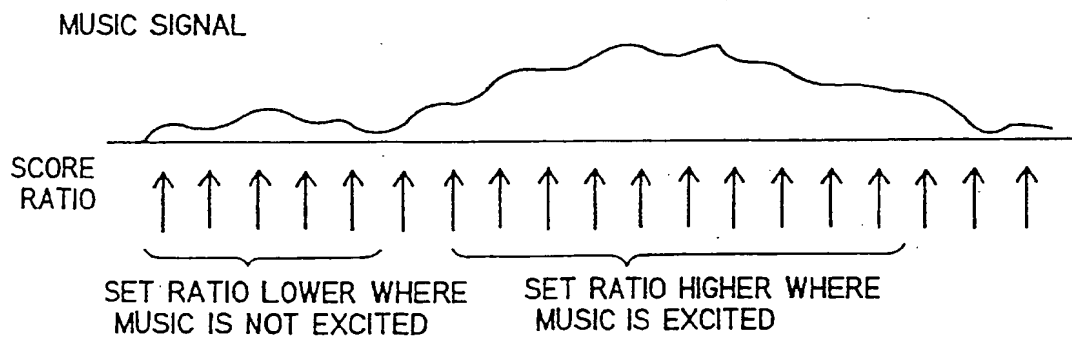


FIG. 9

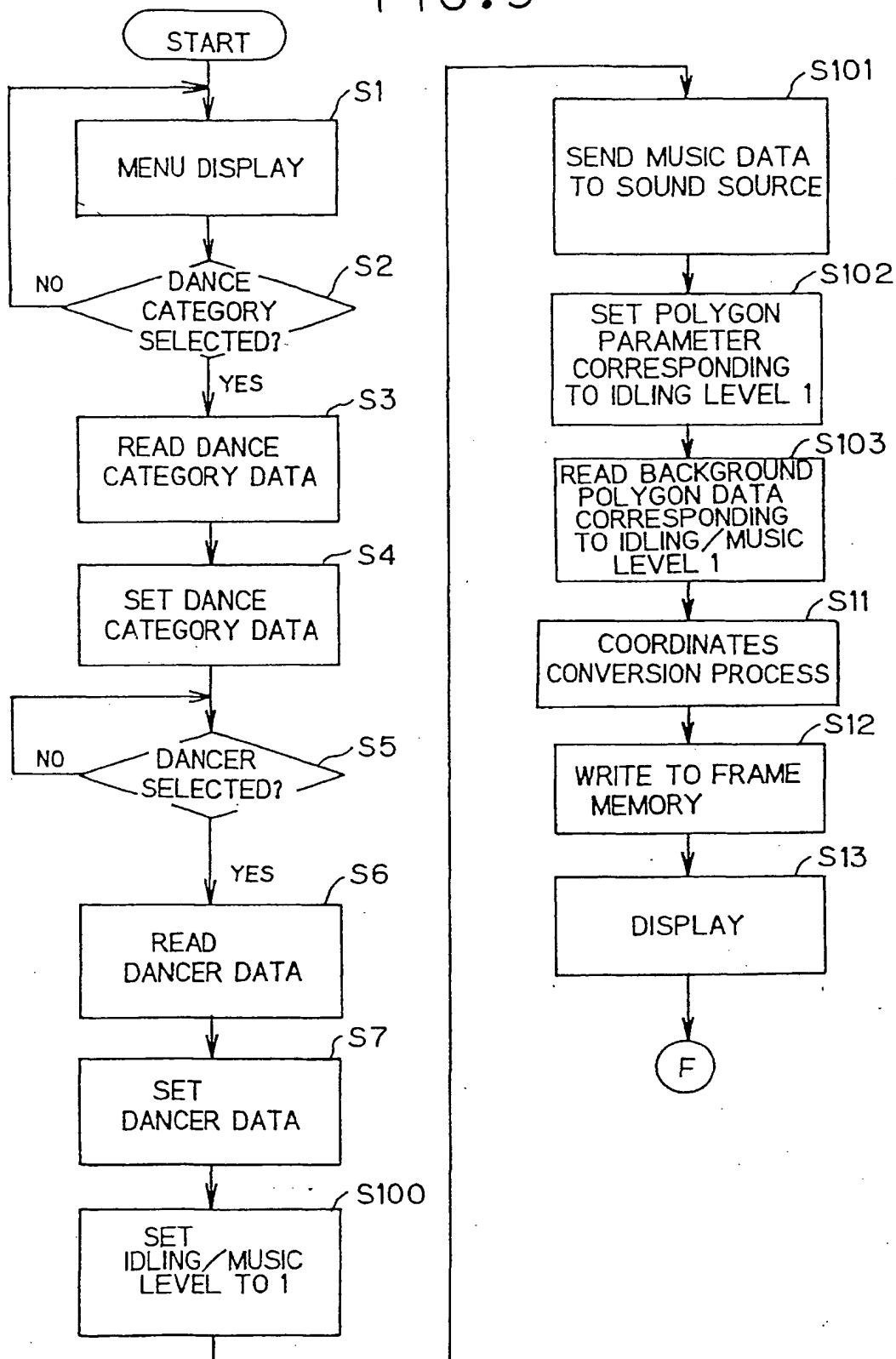


FIG.10

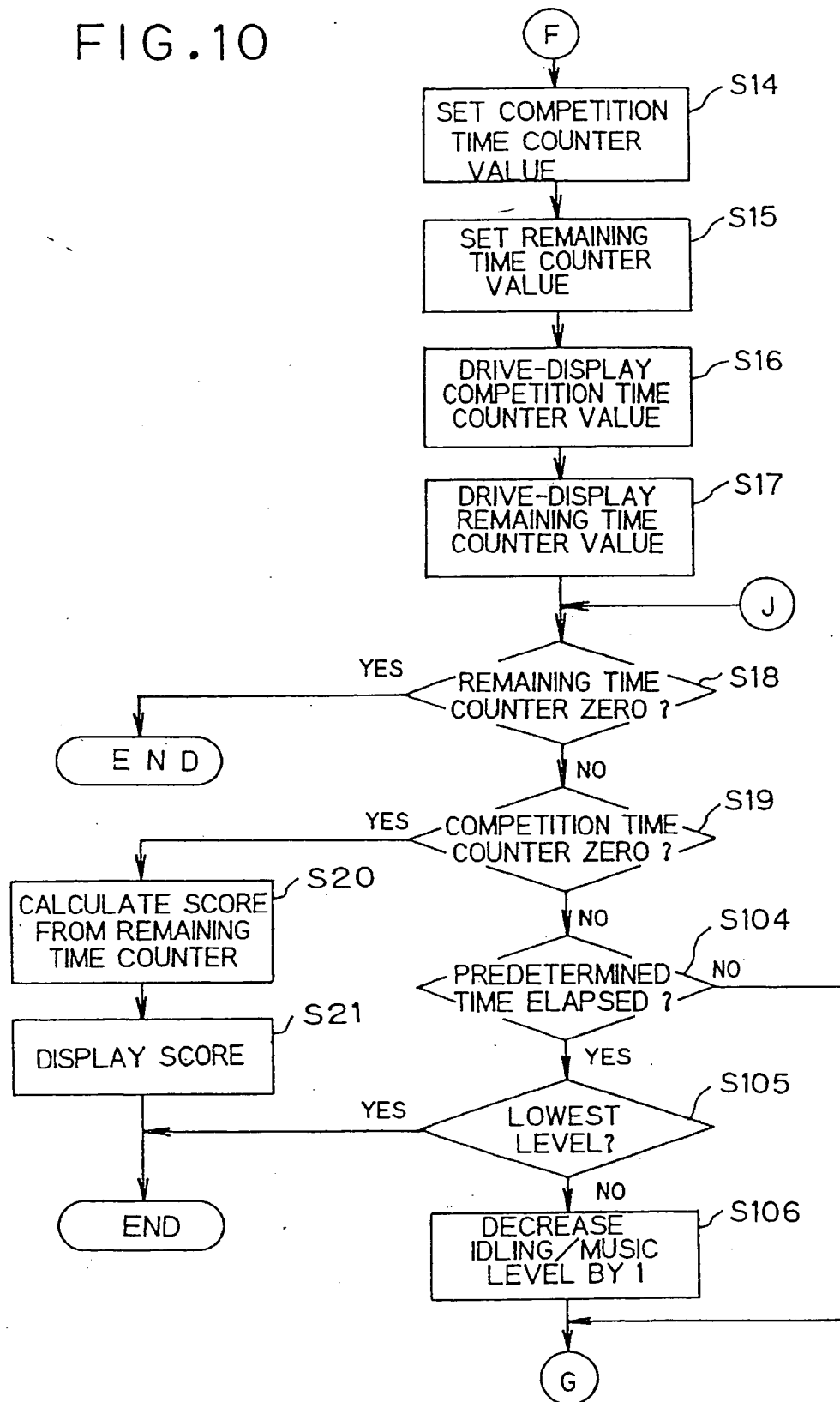


FIG.11

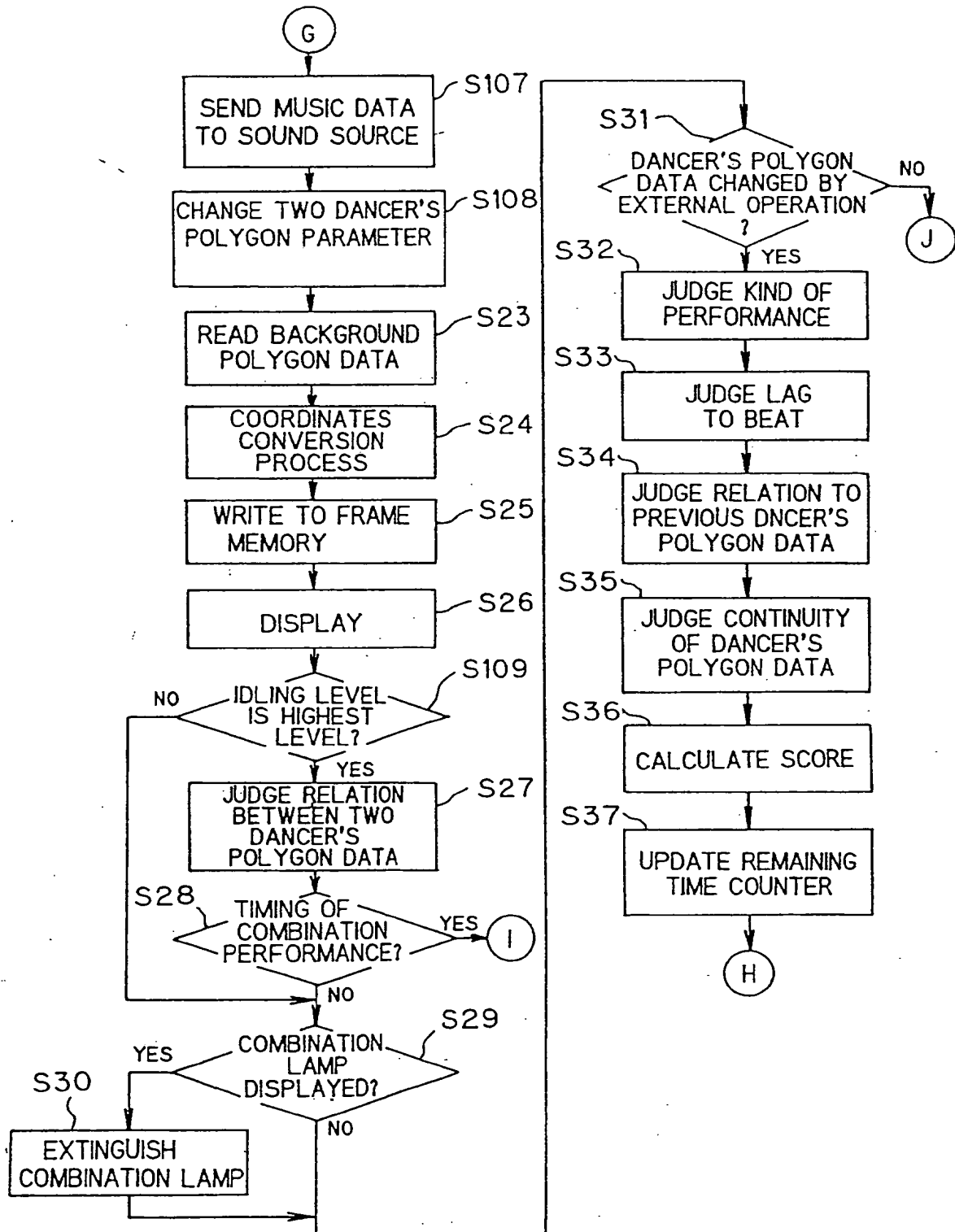


FIG.12

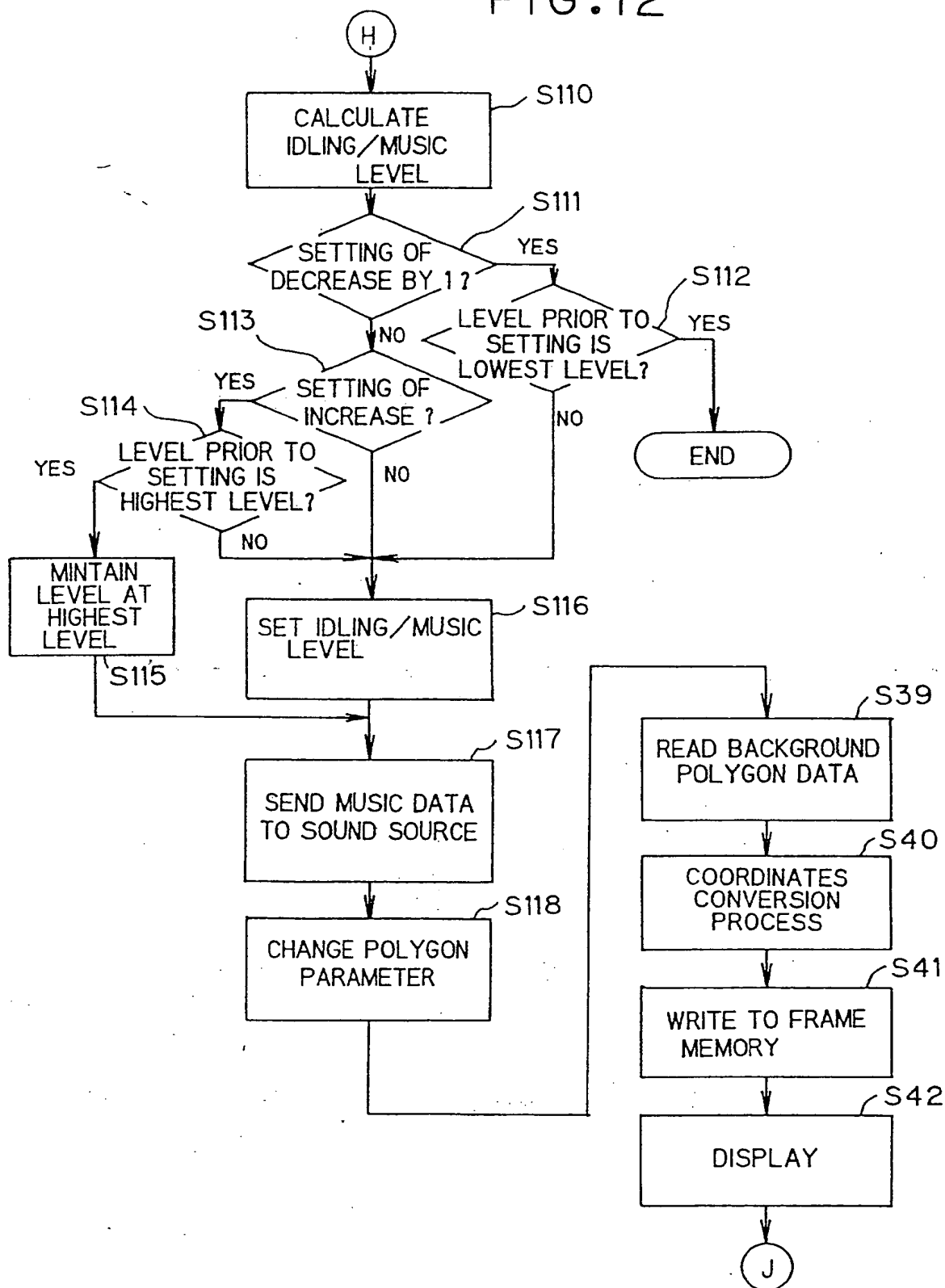


FIG.13

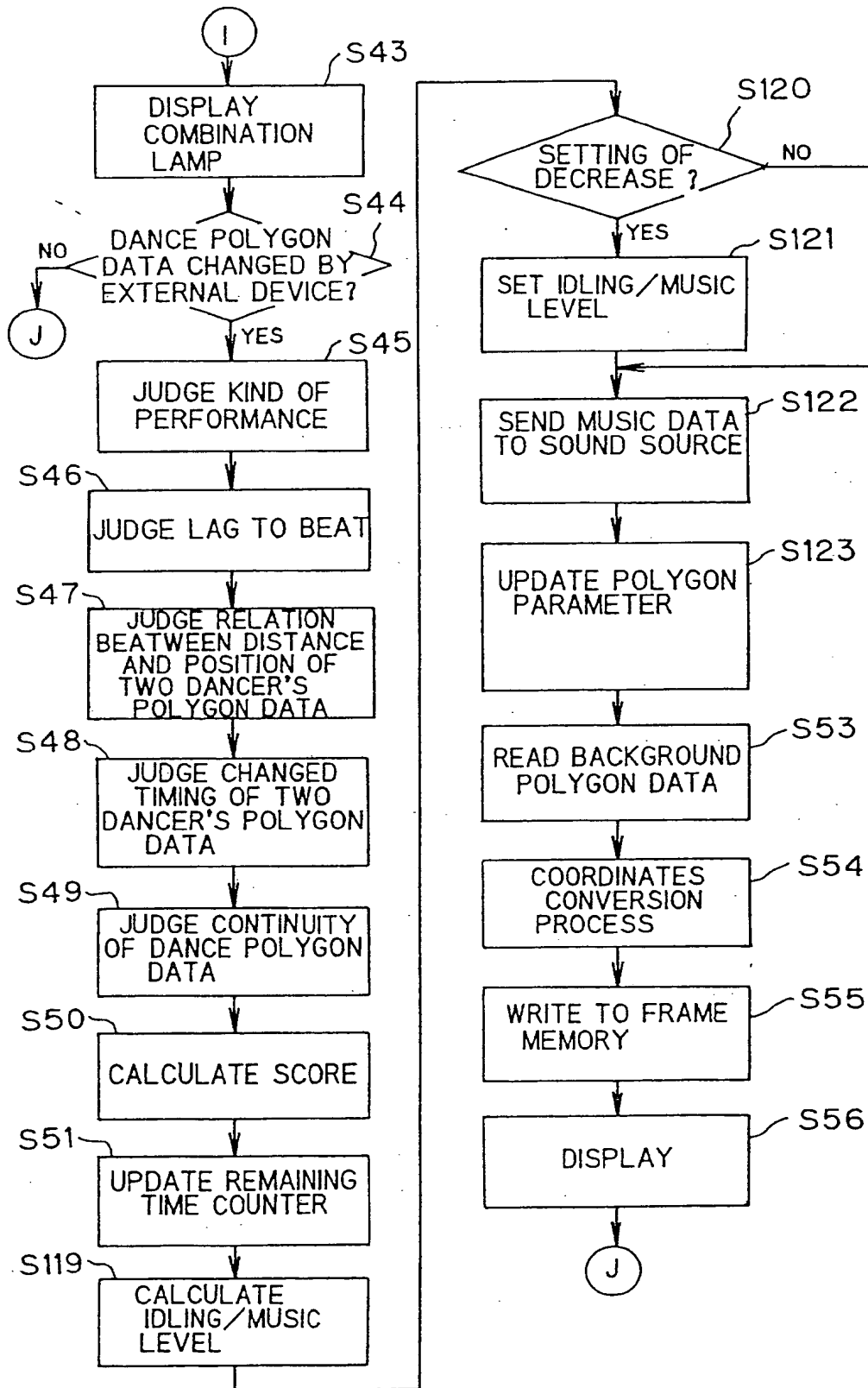
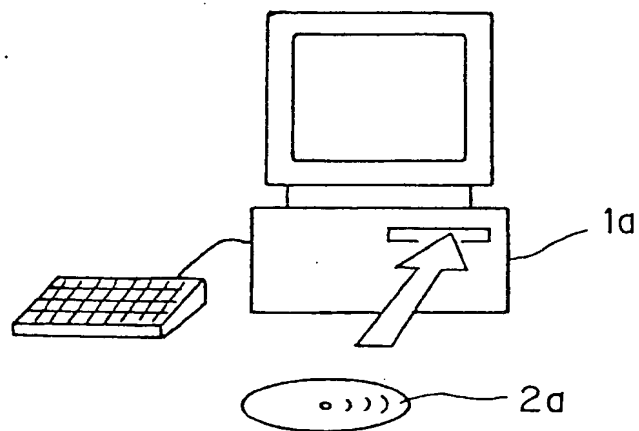


FIG. 14



(19)



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(11)

EP 0 823 270 A3

(12)

EUROPEAN PATENT APPLICATION

(88) Date of publication A3:
03.02.1999 Bulletin 1999/05

(51) Int. Cl.⁶: A63F 9/22
// G06F161:00

(43) Date of publication A2:
11.02.1998 Bulletin 1998/07

(21) Application number: 97113499.4

(22) Date of filing: 05.08.1997

(84) Designated Contracting States:
AT BE CH DE DK ES FI FR GB GR IE IT LI LU MC
NL PT SE

• Pioneer LDC, Inc.
Tokyo-to (JP)

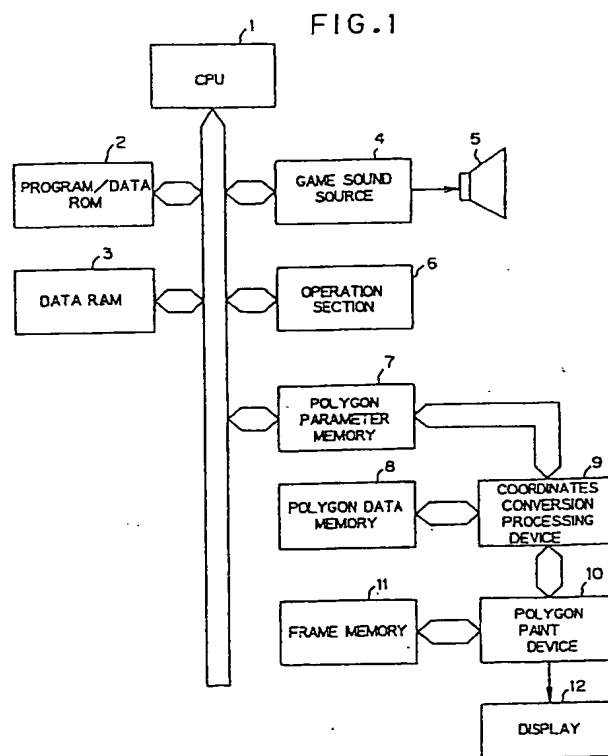
(30) Priority: 05.08.1996 JP 206234/96
30.09.1996 JP 258331/96

(72) Inventor:
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(71) Applicants:
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(54) Video dance game apparatus

(57) A video dance game apparatus for displaying an image of at least two dancers on a screen and controlling the dancers to play various dance performances in accordance with an external operation to thereby offer a dance game, is provided with: an image displaying device (10, 11, 12) for displaying the image of the dancers; a dance music output device (4, 5) for outputting a music signal indicating a dance music; a beat information generating device (1) for generating beat information on the basis of the music signal; a dance performance data selecting and reading out device (1) for selecting and reading out one of the dance performance data pieces stored in a dance performance data memory device; an image control device (7, 8, 9) for controlling the image displaying device to change the image of the dancers such that the dancers play a dance performance corresponding to the read out dance performance data piece; an operation device (6) by which the external operation is inputted, for operating the dance performance data selecting and reading out device in accordance with the external operation to select and read out the one of the dance performance data pieces; and a score calculating device (1) for calculating a game score on the basis of a time lag between a read-out timing of the dance performance data piece and a generation timing of the beat information.



EP 0 823 270 A3



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 97 11 3499

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	WO 96 05766 A (AVNI DOREET :AVNI OFER (IL); ASSIST ADVANCED TECH LTD (IL)) 29 February 1996 * page 10. line 4 - line 17 * * page 11. line 20 - line 21 * * page 14. line 18 - line 27 *	1-4	A63F9/22 //G06F161:00
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P,A	PATENT ABSTRACTS OF JAPAN vol. 097, no. 004, 30 April 1997 & JP 08 335088 A (FUJI ELECTRIC CO LTD:FUJI FACOM CORP), 17 December 1996 * abstract *	1-4	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			G06T A63F
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 14 December 1998	Examiner Wentzel, J
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document</p>			

EPO FORM 1503 03/82 (P04/C01)



(12) EUROPEAN PATENT APPLICATION

(88) Date of publication A3:
03.02.1999 Bulletin 1999/05

(51) Int. Cl.⁶: A63F 9/22
// G06F161:00

(43) Date of publication A2:
11.02.1998 Bulletin 1998/07

(21) Application number: 97113499.4

(22) Date of filing: 05.08.1997

(84) Designated Contracting States:
AT BE CH DE DK ES FI FR GB GR IE IT LI LU MC
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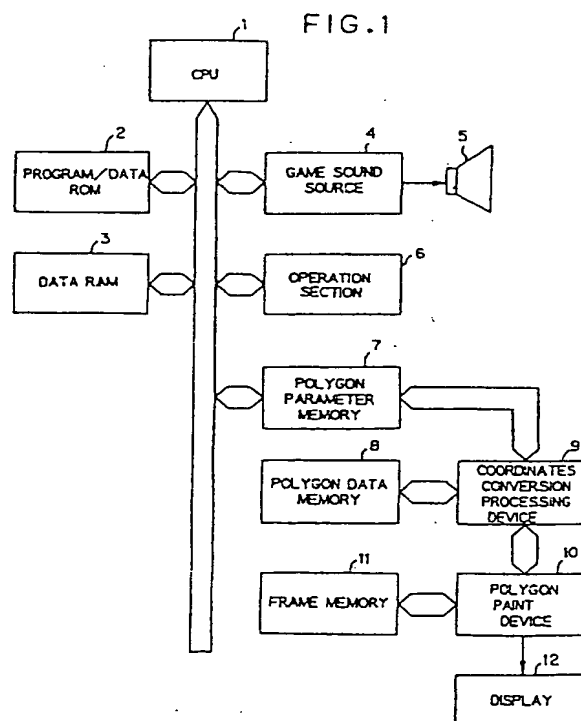
(72) Inventor:
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(54) Video dance game apparatus

(57) A video dance game apparatus for displaying an image of at least two dancers on a screen and controlling the dancers to play various dance performances in accordance with an external operation to thereby offer a dance game, is provided with: an image displaying device (10, 11, 12) for displaying the image of the dancers; a dance music output device (4, 5) for outputting a music signal indicating a dance music; a beat information generating device (1) for generating beat information on the basis of the music signal; a dance performance data selecting and reading out device (1) for selecting and reading out one of the dance performance data pieces stored in a dance performance data memory device; an image control device (7, 8, 9) for controlling the image displaying device to change the image of the dancers such that the dancers play a dance performance corresponding to the read out dance performance data piece; an operation device (6) by which the external operation is inputted, for operating the dance performance data selecting and reading out device in accordance with the external operation to select and read out the one of the dance performance data pieces; and a score calculating device (1) for calculating a game score on the basis of a time lag between a read-out timing of the dance performance data piece and a generation timing of the beat information.



Issued on 31.03.1999 (bibliography updates included)

EP 0 823 270 A3 CORRIGENDUM



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 97 11 3499

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
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A	PATENT ABSTRACTS OF JAPAN vol. 018, no. 484 (P-1798), 8 September 1994 & JP 06 161349 A (ASUKOMU:KK), 7 June 1994 * abstract *	1-4	
P,A	PATENT ABSTRACTS OF JAPAN vol. 097, no. 004, 30 April 1997 & JP 08 335088 A (FUJI ELECTRIC CO LTD; FUJI FACOM CORP), 17 December 1996 * abstract *	1-4	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			G06T A63F
Place of search THE HAGUE		Date of completion of the search 14 December 1998	Examiner Wentzel, J
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document</p>			

EPO FORM 1503 03 02 (P/C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO.

EP 97 11 3499

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The members are as contained in the European Patent Office EDP file on
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14-12-1998

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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(11)

EP 0 903 169 A2

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:

24.03.1999 Bulletin 1999/12

(51) Int Cl.⁶: A63F 9/22

06. Okt. 2004

(21) Application number: 98307501.1

(22) Date of filing: 16.09.1998

(84) Designated Contracting States:

AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
MC NL PT SE

Designated Extension States:

AL LT LV MK RO SI

(30) Priority: 17.09.1997 JP 252208/97

31.07.1998 JP 218056/98

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Yamato-shi, Kanagawa-ken (JP)

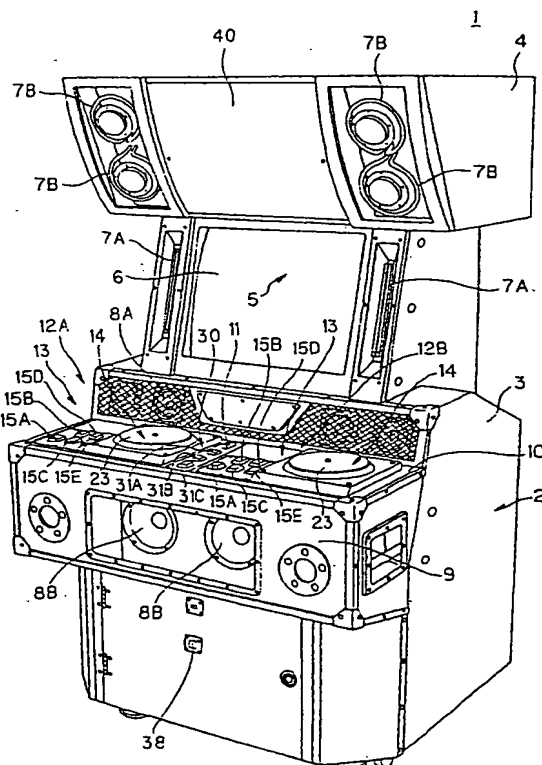
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(54) Music action game machine, performance operation instructing system for music action game and storage device readable by computer

(57) The music action game machine comprises: a main body; an operation input device disposed on a front side of the main body so as to be adjacent to hands of a player facing the front side of the main body, the operation input device having a plurality of operation members; a storage device for storing data of a musical composition and data of a performance procedure associated with the musical composition; a music play device for playing the musical composition based on the data stored in the storage device; an operation instructing device for giving the player a visual instruction to operate the operation members in accordance with progress of a play of the musical composition based on the data stored in the storage device; an effect producing device for producing a performance effect in response to a performance operation performed by the player to each of the operation members; an estimation device for estimating the performance operation of the player based on a relationship between the performance procedure defined by the data stored in the storage device and the performance operation of the player; and an estimation informing device for informing the player of an estimation result determined by the estimation device. Therefore, the player can enjoy the simulation of the performance of the music through the operation of the operation members.

FIG.1



EP 0 903 169 A2

Description

[0001] The present invention relates to a music action game machine whereby a player can enjoy performing operations in time with music, an operation instructing system suitable for the music action game machine and the storage device readable by a computer.

[0002] Recently, disc jockeys who perform operations to remix music with sound effects become popular mainly in the younger generation. However, there are no game machines directed to provide the player with pleasure of simulating the disc jockeys.

[0003] One of objects of the present invention is to provide a music action game machine capable of providing the player with pleasure of performing operations in time with music.

[0004] In order to attain the above object, there is provided a music action game machine comprising:

- a main body;
- an operation input device disposed on a front side of the main body so as to be adjacent to hands of a player facing the front side of the main body, the operation input device having a plurality of operation members;
- a storage device for storing data of a musical composition and data of a performance procedure associated with the musical composition;
- a music play device for playing the musical composition based on the data stored in the storage device;
- an operation instructing device for giving the player a visual instruction to operate the operation members in accordance with progress of a play of the musical composition based on the data stored in the storage device;
- an effect producing device for producing a performance effect in response to a performance operation performed by the player to each of the operation members;
- an estimation device for estimating the performance operation of the player based on a relationship between the performance procedure defined by the data stored in the storage device and the performance operation of the player; and
- an estimation informing device for informing the player of an estimation result determined by the estimation device.

[0005] According to the above-mentioned game machine, when the player operates at least one of the operation members in association with the music, the performance effect corresponding to the operation is mixed on the music. Therefore, the player can take pleasure in performing the music. Since the data of the performance procedure is stored in advance and correct timing to operate each operation member is indicated to the player through the operation instructing device in a vis-

ual manner, the player only has to operate the operation members in accordance with the instruction given from the game machine. Therefore, even if the player who is not skilled in performance of the music can enjoy the game easily. Since the operation of the player is estimated by the game machine and the result thereof is informed to the player, it is possible to enhance the competitive character of the game by changing difficulty of the game variously.

[0006] The operation input device may comprise a disk-shaped operation member as one of the operation members, and the disk-shaped operation member may be operable so as to be turned about an axis thereof.

[0007] The effect producing device may produce a scratch sound effect as the performance effect in response to a turning operation of the disk-shaped operation member, and said scratch sound effect may be similar to an actual scratch sound produced by irregularly turning a phonograph record disk with keeping contact between the phonograph record disk and a stylus of a phonograph player.

[0008] The operation instructing device may comprise: an indicator disposed on the front side of the main body and provided with at least one track extending in a predetermined direction; and a mark indicating device capable of indicating index marks, each of which is provided for indicating operation timing of each of the operation members, in such a manner that each of the index marks moves along the track and then reaches to a fixed operation position defined in the track when the operation timing associated with each of the index marks comes.

[0009] The mark indicating device may change a length of each of the index marks in said predetermined direction in accordance with a length of an operation continuation time during which each of the operation members must be operated.

[0010] In this case, it is possible to request more various performance procedure in comparison with in the case that only the operation timing is indicated to the player. This embodiment is more effective when combined with the above-mentioned disk-shape operation member.

[0011] A plurality of tracks may be provided as said at least one track, and said tracks may be arranged side by side with each other so as to accord with an arrangement of the operation members. In this case, the operation members corresponds to respective tracks different from each other.

[0012] An illumination device may be provided on the front side of the main body, and the effect producing device may control an illumination of the illumination device in response to the performance operation of the player.

[0013] A loud speaker may be provided on the front side of the main body, and the illumination device may comprise a loud speaker illuminator surrounding an outer periphery of the loud speaker.

[0014] A relationship between each of the operation members and the performance effect to be produced in response to the operation thereto may be changed in accordance with the progress of the play of the musical composition.

[0015] The estimation device may estimate the performance operation each time the performance operation is actually performed during the play of the musical composition, and the estimation informing device may inform the estimation result each time the estimation device determines the estimation result.

[0016] The estimation device may estimate the performance operation with referring to a relationship between the performance procedure stored in the storage device and a length of an operation continuation time during which each of the operation members must be operated

[0017] The main body may have a plurality of operating sections, each of which is provided with the operation input device; the estimation device may estimate the performance operation separately for each of the operating sections; and the estimation informing device may inform the estimation result separately for each of the operating sections.

[0018] The estimation device may calculate a score in accordance with superiority of the performance operation, and the estimation informing device may inform the calculated score.

[0019] The data storage device may store a plurality of data sets, each of which includes the data of the musical composition and the data of the performance procedure; and said game machine may further comprise a stage progress management device for controlling progress of a game in such a manner that when the estimation device gives a predetermined level of estimation with respect to the performance operation in one stage in which the musical playing device plays the musical composition based on one of the data sets, the game is allowed to progress to a next stage in which the music play device plays the musical composition and the instructing device instructs the performance operation based on another one of the data sets.

[0020] The effect producing device may produce a reaction effect as one type of the performance effect when the game reaches to an end of said one stage, and the reaction effect may be changed in accordance with the estimation result at the end of said one stage.

[0021] The operation instructing device may make a decision as to whether or not operation timing of each of the operation members comes, and instruct the performance operation to the player in a different visual manner in accordance with a result of said decision. In this case, the operation timing may have a certain width of time.

[0022] The estimation device may make a decision as to whether or not operation timing of each of the operation members comes, and estimate the performance operation when it is judged that the operation timing

comes.

[0023] The operation instructing device may make a decision as to whether or not operation timing of each of the operation members comes, and change a standard, with which the performance operation is estimated, in accordance with a result of said decision.

[0024] The estimation device may estimate the performance operation based on a difference between timing of the performance operation defined by the data of the performance procedure and timing at which the player actually performed the performance operation.

[0025] The effect producing device may produce effects different from each other in response to respective operations of the operation members, and each of the effects corresponds to the performance effect.

[0026] The effect producing device may produce a reaction effect as one type of the performance effect each time the estimation device determines the estimation result, and the reaction effect may be changed in accordance with the estimation result.

[0027] The effect producing device may produce a predetermined sound effect so as to remix sounds of the musical composition with the sound effect in accordance with the performance operation.

[0028] The storage device may store a data set including the data of the musical composition and a plurality of operation data sections associated with the musical composition, each of the operation data sections corresponding to the data of the performance procedure; at least one of the operation data sections may be prepared so as to make difficulty with respect to the performance procedure defined thereby easier than that defined by another one of the operation data sections; and the operation instructing device may select any one of the operation data sections and instructs the player to operate the operation members based on said selected one of the data sections.

[0029] In this case, it is possible to present selectively one of the plurality of the performance procedures to the player in accordance with the skill of the player. Therefore, the player can play the game with appropriate difficulty.

[0030] The performance procedure defined by said at least one of the operation data sections may be substantially equal to a procedure in which a part of operations to the operation members is omitted in comparison with the performance procedure defined by said another one of the operation data sections.

[0031] The storage device may store automatic play data for producing the performance effect corresponding to each of the operations which are omitted in comparison with the performance procedure defined by said another one of the operation data sections; and the game machine may further comprise an automatic play device capable of producing the performance effect based on the automatic play data independently of the performance operation of the player.

[0032] The music action game machine may further

comprise an operational relationship control device for changing a relationship between operations of the operation members defined by the data of the performance procedure and the operation members which are designated to be operated through the instruction of the operation instructing device with respect to the same musical composition.

[0033] The operation instructing device may comprise:

an indicator disposed on the front side of the main body, at least one part of the indicator being provided with a plurality of tracks which extend in a predetermined direction and which correspond to the operation members, respectively; and
a mark indicating device capable of indicating index marks,
each of the index marks may correspond to each operation timing of the operation members which will come in a certain period from a present to future in a game, and the index marks may be disposed in the tracks so as to be arranged from a predetermined position toward one side of the predetermined direction in accordance with time order therebetween.

[0034] The mark indicating device may be capable of changing an indication manner of the index marks between a first mode and a second mode, the first mode may be prepared to set a relationship between the index marks and the tracks equal to a relationship between the operation members and the operation timing defined by the data of the performance procedure, and a second mode may be prepared to set the relationship between the index marks and the tracks in a different manner from that of the first mode.

[0035] The estimation device may estimate the performance operation with interpreting that a relationship between the operation timing of each of the operation members defined by the data of the performance procedure and the performance operation to each of the operation members is changed in accordance with the relationship between the index marks and the tracks when in the second mode.

[0036] The mark indicating device may be capable of selecting a third mode in which the index marks are hidden in a specific range which extends from the predetermined position in the tracks toward said one side of the predetermined direction.

[0037] The main body may have a plurality of operating sections, each of which is provided with the operation input device; the operation instructing device may be capable of instructing the same performance procedure to each of the operating sections with respect to the same musical composition; the estimation device may estimate the performance operation separately for each of the operating sections; and the estimation informing device may inform the estimation result separately

for each of the operating sections.

[0038] The main body may be provided with a plurality of operating sections arranged in a lateral direction thereof, each of the operating section being provided with the operation input device; the front side of the main body may be provided with a display device for displaying a game image; the operation instructing device may be capable of changing a display manner of the display device between a first display mode and a second display mode; the first display mode may be prepared to display images for indicating timing of the performance operation on a screen of the display device with leaving a space between each of the images in the lateral direction in accordance with an arrangement of the operating sections; and the second display mode may be prepared to display the images for indicating timing in such a manner that a space therebetween is less than that in the first display mode.

[0039] Each of the data of the musical composition and the data of the performance effect may be stored in the storage device as PCM data.

[0040] According to another aspect of the present invention, there is provided a music action game machine comprising:

a main body;
an operation input device disposed on a front side of the main body so as to be adjacent to hands of a player; facing the front side of the main body, the operation input device having a plurality of operation members;
a storage device for storing data of a performance procedure associated with a predetermined musical composition;
an operation instructing device for giving the player a visual instruction to operate the operation members based on the data of the performance procedure stored in the storage device;
an effect producing device for producing a performance effect in response to a performance operation of the player to each of the operation members;
an estimation device for estimating the performance operation of the player based on a relationship between the performance procedure defined by the data stored in the storage device and the performance operation of the player; and
an estimation informing device for informing the player of an estimation result determined by the estimation device.

[0041] According to still another aspect of the present invention, there is provided a music action game machine comprising:

an operation input device having a plurality of the operation members and capable of issuing operation input signals different from each other in accordance with each of operations to the operation

members;

a storage device for storing data of a musical composition, data of a performance procedure with respect to each of the operation members of the operation input device, and data of sound effects corresponding to each of the operation members;

a music play device for playing the musical composition based on the data of the musical composition stored in the storage device;

an performance procedure presenting device for presenting the player with the performance procedure in a visual manner in association with a play of the musical composition based on the data of the performance procedure stored in the storage device,;

a sound effect producing device for producing the sound effects based on the operation input signals issued from the operation input device and the data of the sound effects stored in the storage device;

an estimation device for estimating operations of the player based on the operation input signals issued from the operation input device and the data of the performance procedure stored in the storage device; and

an estimation informing device for informing an estimation result determined by the estimation device.

[0042] Another one of objects of the present invention is to provide an operation instructing system suitable for instructing an operation of a music action game machine.

[0043] In order to attain the above object, there is provided a performance operation instructing system, which instructs a player to operate at least one operation member at a predetermined timing in association with progress of a play of a predetermined musical composition, comprising:

an indicator provided with at least one track extending in a predetermined direction; and
a mark indicating device capable of indicating index marks, each of which is provided for indicating operation timing of the operation member, in such a manner that each of the index marks moves along the track and then reaches to a fixed operation position defined in the track when the operation timing associated with each of the index marks comes.

[0044] According to the above-mentioned operation instructing system, it is possible to provide a music action game machine with a simple operation system such that the player may operate the operation member at timing when the index mark corresponding the operation member reaches to the fixed performance operation position. Therefore, the player may easily become accustomed to the operation of the game. Since the performance operation position is fixed, the player may concentrate on the game with fixing his eyes on a certain posi-

tion in the indicator. It is not necessary for the player to move his eyes to follow each movement of each index mark.

[0045] The mark indicating device may change a length of each of the index marks in said predetermined direction in accordance with a length of an operation continuation time during which the operation member must be operated.

[0046] A plurality of operation members may be provided as said at least one operation member, and a plurality of tracks may be provided as said at least one track, said tracks being arranged side by side with each other so as to accord with an arrangement of the operation members.

[0047] Note that the instructing system of the present invention can be used in various types of the music game machines besides the game machine mentioned above.

[0048] Still another objects of the present invention is to provide a storage device which is readable by a computer and which stores a program and data necessary for performing a game in a music game machine.

[0049] In order to attain the above object, there is provided a storage device readable by a computer which stores data defining a procedure for operating operation members provided in a game system in association with a predetermined music, and a program for instructing a player to operate the operation members through a screen of a display device provided in the game system, and said program is prepared for causing the computer to execute steps of:

displaying an image of an instruction on the screen of the display device to operate the operation members based on the data defining the procedure;
producing a performance effect in response to an operation of the operation members performed by the player;
estimating the operation of the operation members based on a relationship between the data defining the procedure and the operation performed by the player; and
informing a result of said estimating step to the player.

[0050] According to another aspect of the present invention, there is provided a storage device readable by a computer which stores data defining a procedure for operating operation members provided in a game system in association with a predetermined music, data of sound effects to be produced in association with operation input signals issued from the operation members in response to operations thereof, and a program for instructing a player to operate the operation members through a screen of a display device provided in the game system, and said program is prepared for causing the computer to execute steps of:

displaying an image of an instruction on the screen of the display device to operate the operation members based on the data defining the procedure; producing at least one of the sound effects based on the operation input signals issued from the operation members and the data of the sound effects; estimating operations performed by the player based on the operation input signals issued from the operation members and the data defining the procedure; and informing a result of said estimating step to the player.

[0051] According to still another aspect of the present invention, there is provided a storage device readable by a computer which stores a program for giving a player an instruction to operate at least one operation member provided in a game system at a predetermined timing in association with progress of a play of a predetermined musical composition, said instruction is given through a screen of a display device provided in the game system, and said program is prepared for causing the computer to execute steps of:

displaying an indicator on the screen of the display device, said indicator being provided with at least one track extending in a predetermined direction; and

indicating index marks, each of which is provided for indicating operation timing of the operation member, in such a manner that each of the index marks moves along the track and then reaches to a fixed operation position defined in the track when the operation timing associated with each of the index marks comes.

[0052] In the present invention, the storage device may include a magnetic storage device such as a hard disk drive or a floppy disk, an optical or a magneto-optical storage device such as a CD-ROM, a semiconductor storage device such as a RAM or a ROM, or the other various types of the storage devices. The performance operation includes an action to complete the music by playing one part of the music by the player as well as an action to remix sounds of a complete music composition with an effect of sound or light.

[0053] Still further objects, features and other aspect of the present invention will be understood from the following detailed description of the preferred embodiments of the present invention with reference to the accompanying drawings.

FIG. 1 is a perspective view of a music action game machine in accordance with one embodiment of the present invention;

FIG. 2 is a vertical sectional view of the game machine of FIG. 1, which is taken along a front and rear side direction thereof;

FIG. 3 is an enlarged view showing a keyboard input unit provided in the game machine of FIG. 1;

FIG. 4 is a sectional view of a turntable input unit provided in the game machine of FIG. 1;

FIGS. 5A and 5B are views showing details of a detection mechanism provided in the turntable input unit of FIG. 4; namely, FIG. 5A is a plan view of a slit disk connected with a lower end of a rotary shaft and FIG. 5B is an enlarged view of a portion Vb in FIG. 5A;

FIG. 6 is a block diagram showing a control system of the game machine of FIG. 1;

FIG. 7 is a view showing a relationship between music performance data and a performance procedure corresponding thereto;

FIG. 8 is a view showing an indication table for defining a relationship between operation members and a sound effect of the game machine of FIG. 1 for each phrase of the musical composition to be played;

FIG. 9 is a diagram illustrating an example of a game image displayed on a screen of the game machine during game play;

FIG. 10 is a diagram illustrating an indicator displayed in the game image of FIG. 9 for indicating timing of performance operation to the player;

FIG. 11 is a flow diagram showing an example of a stage arrangement in the game machine of FIG. 1;

FIG. 12 is a flow chart showing a process for one stage executed by a CPU of FIG. 6;

FIGS. 13A to 13C are diagrams showing a configuration of a data set for a musical composition X stored in an auxiliary storage device of FIG. 6 in accordance with another embodiment of the present invention;

FIG. 14 is a diagram showing a configuration of the performance data of FIG. 13;

FIG. 15 is a diagram showing a manner for loading operation timing data into a RAM;

FIG. 16 is a flow chart showing a process for one stage executed by a CPU of FIG. 6 in the other embodiment;

FIG. 17 is a flow chart following FIG. 16;

FIG. 18 is a diagram illustrating display examples of the indicator in a normal mode and an easy mode for reducing operational difficulty;

FIG. 19 is a diagram illustrating display examples of the indicator in a random and a non-random mode;

FIG. 20 is a diagram illustrating display examples of the indicator in a hidden mode and a non-hidden mode;

FIG. 21 is a view showing a modification of performance operation sections;

FIG. 22 is a plan view showing a slide type volume switch prepared for the performance operation; and

FIGS. 23A and 23B are diagrams showing an embodiment in which display positions of the indicators

on the screen are changeable between left and right side ends of the screen and the center thereof.

[0054] The preferred embodiment of the present invention will now be explained below with reference to the attached drawings.

[0055] FIG. 1 shows an appearance of a music action game machine according to the present invention and FIG. 2 shows an internal structure thereof. The game machine 1 is constructed by attaching various parts on or in the main body 2. The main body 2 is provided with a main housing 3 and a top box 4 mounted on the top of the main housing 3. At the upper portion of the main housing 3, there is provided a display portion 5. The display portion 5 is provided with a CRT monitor 6, and both sides of the monitor 6 are provided illumination lamps 7A, 7A so as to extend vertically. Below the display portion 5 there is provided loud speakers 8A...8A. The main housing 3 is provided below the loud speakers 8A with a forward projecting portion 9, and the front side of the projecting portion 9 is provided with a loud speaker units 8B, 8B.

[0056] The projecting portion 9 is provided on the top thereof with a control panel 10. The control panel 10 is positioned in the vertical direction so as to be adjacent to hands of a player (or players) when the player stands in front of the game machine 1 with facing a screen of the monitor 6. The control panel 10 is provided with a coin insertion slot 11 located at the center thereof, a performance operating section 12A for the first player located at the left side of the coin insertion slot 11, and a performance operating section 12B for the second player located at the right side of the coin insertion slot 11. Each of the operating sections 12A and 12B is provided with an operation input device comprising a keyboard input unit 13 and a turntable input unit 14.

[0057] The keyboard input unit 13 is provided with five keys 15A, 15B, 15C, 15D, and 15E consisted of push button switches. The arrangement of the keys 15A to 15E is similar to the key arrangement of musical instruments. Namely, the three keys 15A, 15C and 15E are juxtaposed on a side near the player while the two keys 15B and 15D are juxtaposed behind thereof. Also, the rear side keys 15B and 15D are aligned with boundary positions between the front side keys 15A, 15C, and 15E. Hereinafter, each of the operating sections 12A and 12B will be denoted as the operating section 12, if it is not necessary to distinguish the two sections 12A and 12B from each other, and each of the keys 15A to 15E may be denoted as the key 15.

[0058] In FIG. 1, the top of each key 15 is illustrated as a flat plane, however, as shown in FIG. 3, each key 15 may be provided with a projecting portion 15p on one side far from the player. Each key 15 is provided with an indicating lamp 17 such as an LED. Instead of the indicating lamp 17, an illuminant such as an electric bulb or the like may be provided inside the key 15 to emit light from the key 15 itself.

[0059] FIG. 4 shows a detail of the turntable input unit 14. The turntable input unit 14 comprises a base 20 mounted on the control panel 10, a rotary shaft 22 supported on the base 20 through a bearing 21 so as to rotate about an axis thereof, and a slide disk 23 as a disk-shaped operation member fitted into a circular recess 20a of the base 20 and connected with the upper end 22a of the rotary shaft 22 so as to be rotatable therewith. The slide disk 23 is in imitation of a phonograph record disk, and the upper surface 23a is exposed outside of the control panel 10. The player can enjoy a simulation of scratch play by turning the slide disk 23 in a clockwise or counter-clockwise direction with putting fingers on the upper surface 23a. The scratch play is known as an action to produce various scratch sounds by manually and irregularly turning the phonograph record disk with keeping the contact between the record disk and a stylus of a phonograph player.

[0060] Between the slide disk 23 and the bottom surface of the circular recess 20a of the base 20, there is provided with a felt sheet 24 as means for giving friction resistance against the turning movement of the slide disk 23. The felt sheet 24 is formed in a disk-shape and is smaller than the slide disk 23. The felt sheet 24 may have at least one through hole to maintain the friction resistance in a proper degree.

[0061] The turntable input unit 14 is provided with a detection mechanism 28 for detecting information with respect to an operation of the slide disk 23, such as a turning speed, a turning direction or the like. The detection mechanism 28 comprises a slit disk 25 fixed to the lower end of the rotary shaft 22 by using screws 26...26 so as to be rotatable therewith, and a pair of sensors 27A and 27B provided on an outer periphery of the slit disk 25. As shown in FIG. 5A, on the outer periphery of the slit disk 25, there are provided a plurality of slits 25a...25a with leaving a certain pitch angle P therebetween in a circumferential direction of the slit disk 25.

[0062] Each of the sensors 27A and 27B is a photo-interrupt-type sensor in which a predetermined beam of light is emitted from an emitter 27p toward a receiver 27q and the receiver 27q issues a predetermined signal which changes between ON and OFF in accordance with the intensity of the light received therein. As shown in FIG. 5B, the sensors 27A and 27B are arranged in such a manner that when a center line A of the sensor 27A is positioned in the middle of the two slits 25a, 25a which are adjacent to each other, a center line B of the other sensor 27B is deviated from a center line C of the nearest slit 25a by $P/4$ i.e. one-fourth of the pitch angle P in the circumferential direction. The deviation between the center lines B and C is not limited to $P/4$; namely, the deviation may be set to various values except $P/2$.

[0063] In the above-mentioned turntable input unit 14, when the slide disk 23 is turned, the slit disk 25 also turns therewith, and the signals issued from the sensors 27A and 27B cyclically change in a predetermined cycle depending on the turning speed of the slit disk 25.

Therefore, it is possible to calculate the turning speed of the slide disk 23 by detecting the cycle of the signals. Also, it is possible to distinguish the turning direction of the slide disk 23 on the basis of a phase difference between the signals issued from the sensors 27A and 27B, in other words, the degree of deviation between the timing at which the signals changes between ON and OFF.

[0064] As shown in FIGS. 1 and 2, the control panel 10 is provided at the center thereof with a supplemental input device 30. The supplemental input device 30 comprises three push button switches 31A, 31B and 31C disposed in front of the coin insertion slot 11 so as to be aligned in the front-and-rear side direction. Also, as shown in FIG. 2, the main body 2 is provided therein with a coin control device 35. A coin inserted into the slot 11 falls into the control device 35 through a chute 36. The control device 35 examines whether the inserted coin is acceptable or not, and feeds the coin which is judged to be acceptable to a stock container 37 while feeding the coin which is judged not to be acceptable to a coin return port 38 (refer to FIG. 1).

[0065] As shown in FIG. 1, the top box 4 of the main body 2 is provided at the center on the front side thereof with a decoration panel 40, and both sides thereof are provided loud speakers 8C...8C. Each loud speaker 8C is installed in a downward oblique manner that the top side thereof is located forward from the lower side thereof to emphasize existence thereof to the player. On the periphery of each loud speaker 8C, there is provided a illumination lamp 7B of a tube-type which is circularly curved so as to surround the loud speaker 8C.

[0066] FIG. 6 shows a structure of a control system provided in the game machine 1. As is apparent from FIG. 6, the game machine 1 comprises a CPU 50 mainly consisted of a microprocessor to perform various calculations and operation controls necessary for progress of the game, an image processing unit 51 for displaying desirable images on the screen of the monitor 6 in accordance with requests from the CPU 50, a sound processing unit 52 for producing sounds through the loud speakers 8A, 8B and 8C in accordance with requests from the CPU 50, an illumination control unit 53 for turning the illumination lamps 7A and 7B ON and OFF in accordance with requests from the CPU 50, and a storage means consisted of a RAM 54, a ROM 55 and an auxiliary storage device 56. The auxiliary storage device 56 is preferably a hard disk drive with a magnetic storage media having a capacity far greater than that of each of the RAM 54 and the ROM 55. The sound processing unit 52 is capable of receiving PCM (Pulse Code Modulation) or ADPCM (Adaptive Differential Pulse Code Modulation) data stored in the auxiliary storage device 56 in response to requests from the CPU 50 and producing sounds through the loud speakers 8A, 8B and 8C in association with the data.

[0067] Each of the above mentioned units 51 to 53, the RAM 54, the ROM 55 and the auxiliary storage device 56 is electrically connected with the CPU 50

through a bus 57. Also, the CPU 50 is electrically connected with the keyboard input unit 13, the turntable input unit 14, the supplemental input device 30 and the coin control device 35 through the bus 57.

[0068] The ROM 55 stores a program and data necessary for controlling a basic operation of the game machine 1 during the start-up thereof or the like. The auxiliary storage device 56 stores music data for reproducing various musical compositions as BGM (Back Ground Music), and performance data for defining a procedure of an performance operation to be performed with respect to each musical composition. These data are loaded into a predetermined area in the RAM 54 in accordance with requests from the CPU 50. The music data is formed, for example, as PCM data or ADPCM data.

[0069] FIGS. 7 and 8 show an example of a relationship between the music data stored in the auxiliary storage device 56 and a performance procedure corresponding thereto. In these figures, the operation members are represented as keys A to E, a turntable and adlib keys A to C. The keys A to E correspond to the keys 15A to 15E in FIG. 1, respectively. A turntable corresponds to the slide disk 23 in FIG. 1. Further, adlib keys A, B and C in FIG. 8 correspond to the push button switches 31A to 31C in the supplemental input device 30, respectively.

[0070] As shown in a block diagram of FIG. 7, the musical composition X comprises a plurality of phrases F1, F2, F3, The performance procedure with respect to the composition X, for example in the phrase F1, is prepared as illustrated in a time chart of FIG. 7. In the time chart, each rectangular portion, i.e. hatched portion represents a time period during which each operation member is to be operated, the left end of the rectangular portion represents a start time of the operation, the right side thereof represents an end time of the operation, and a length of the rectangular portion corresponds to a length of time during which the operation must be continued. The auxiliary storage device 56 stores numerical data of the start time and the end time for each of the keys A to E and the turntable coded in accordance with the time chart in FIG. 7.

[0071] The storage device 56 also stores data of various sound effects to be produced through the loud speakers in response to the operation to each of the keys A to E and the adlib keys A to C. In order to change the sound effects every phrase of the musical composition, the storage device 56 stores a data table TB (illustrated in FIG. 8) in association with the music data. In the data table TB, the sound effect to be produced in each of the phrases F1, F2, F3 ... is assigned to each of the keys A to E and the adlib keys A to C. For example in the phrase F1, the sound effects 1 to 5 are assigned to the keys A to E and the sound effects 6 to 8 are assigned to the adlib keys A to C, respectively. As mentioned above, the data for producing the sound effects 1, 2, ... are also stored in the storage device 56. Note

that, it is possible to use various sounds considered to be proper for performing the music, such as sounds of musical instruments, sounds of voice, sounds of hand-claps or the like. The data of sound effects may be formed as PCM or ADPCM data.

[0072] Since the turntable input device 14 is provided to give the player with the pleasure of the simulation of the scratch play, it is preferable to assign a scratch sound effect to the operation of the slide disk 23. The scratch sound effect should be tuned so as to be similar to the real scratch sound which is produced by performing the scratch play with using the real phonograph record disk and the phonograph player. It is also preferable to change the scratch sound effect in accordance with the turning direction of the slide disk 23 or the rotation speed of the slide disk 23.

[0073] Since the two operating sections 12A and 12B are provided in the game machine 1, two sets of the performance data are prepared for the operating sections 12A and 12B and stored into the storage device 56. If the two sets of the performance data are different from each other, it is possible to provide the player (or players) with a game play like a musical dialogue or duet, and to producing different sound effects in response to the performance operations to each operating section 12. Therefore, it is possible for the player (or players) to play various performances in contrast with the case in which only one of the operating sections 12 is used, thereby increasing interest of the game.

[0074] FIG. 9 shows a game image displayed on the screen of the monitor 6 through the image processing device 51 during the game play. The game image comprises a main display portion 60 disposed at a center thereof, a groove gauge 61 disposed above the main display portion 60, and a pair of score frames 62A and 62B disposed below the main display portion 60. The main display portion 60 is a portion in which a video image or the like is displayed to heat up the atmosphere of the game. For example, dance scenes matching the music played through the game machine 1 are displayed.

[0075] The groove gauge 61 is provided with a gauge frame 61a and a gauge bar 61b capable of expanding and contracting in accordance with superiority of the game play with the left end of the frame 61a being as a reference. Note that, the gauge bar 61b is illustrated with hatching in FIG. 9. The score frame 62A is provided for displaying therein a game score corresponding to the performance operation to the performance operating section 12A, while the score frame 62B is provided for displaying therein a game score corresponding to the performance operation to the performance operating section 12B.

[0076] The game image is also provided at the left and right side thereof with indicators 65A and 65B. Each of the indicators 65A and 65B has the same configuration. Hereinafter, each indicator may be denoted as the indicator 65 if it is not necessary to distinguish the indicators

65A and 65B from each other. The indicator 65 is provided with five rows of key tracks 66A, 66B, 66C, 66D and 66E each extending in the vertical direction, and a turntable track 67. The key tracks 66A to 66E are provided for indicating operation timing of keys 15A to 15E, respectively, and the turntable track 67 is provided for indicating operation timing of the slide disk 23.

[0077] In the key tracks 66A to 66E, there are displayed index marks 68...68 corresponding to the keys 15A to 15E, and in the turntable track 67 are displayed an index mark 69 corresponding to the slide disk 23. These marks 68, 69 are displayed so as to move downward along the key tracks 66A to 66E or the turntable track 69 in accordance with the progress of the play of the music as indicated by an arrow V (refer to imaginary lines illustrated in the track 66B).

[0078] When each of the marks 68, 69 reaches to a performance operation position PP defined at the lower end of the tracks 66A to 66E and 67, the operation timing of each of the keys 15A to 15E and the slide disk 23 associated with each track comes. At the lower ends of the tracks 66A to 66E and 67, there are displayed key type icons 70A to 70E, which represent the keys 15A to 15E respectively, and turntable type icon 71 representing the slide disk 23 so as to be adjacent to the performance operation position PP.

[0079] In FIG. 10, the mark 68 displayed in the left end track 66A has just reached to the performance operation position PP, so that the player is indicated to operate the key 15A from this moment until the mark 68 will disappear below the track 66A. Each of the lengths L1 and L2 of the marks 68 and 69 is changed in accordance with a length of an operation continuation time of the key 15 or the slide disk 23, in other words a time period during which the player must continuously operate the key 15 or the slide disk 23, to thereby indicate the player to the operation continuation time as well as the start time of the performance operation.

[0080] The above-mentioned display of the marks 68 and 69 may be carried out, for example by the steps of: setting indicator display range which corresponds to the length of the tracks 66A to 66E and 67 on the time chart of FIG. 7; moving the indicator display range toward the right side in FIG. 7; and repeating renewal of the display of the indicator 65 with considering a relationship between the time chart in FIG. 7 and the display of the indicator 65 such that the left and right ends of the indicator display range corresponds to the lower and upper end of the tracks 66A to 66E and 67, respectively, and the rectangular portions in the time chart correspond to marks 68 and 69.

[0081] In the present invention, the indication of the operation continuation time depending on the length of the mark 68 or 69 may be omitted; namely, each mark may be displayed with a fixed length to thereby indicate only the operation timing. Also, the indication of the indicator 65 may change in such a manner that the length of each index mark represents a time period during

which the player must hit the key 15 repeatedly.

[0082] In the above-mentioned game machine 1, when acceptable coins of predetermined numbers are inserted into the coin insertion slot 11, the coin control device 35 issues a game start signal to the CPU 50, and the CPU 50 starts a predetermined game process in response to the signal. If the amount of the inserted coins are enough for two players, a selection image which prompts the player to select either one of the single player mode or two players mode is displayed on the screen of the monitor 6, and the CPU 50 determines which one is selected in accordance with a selection operation of the player. The selection operation may be done by using the supplement input device 30. The single player mode is a mode in which the game is played with using only one combination of the indicator 65 and the operating section 12, and the two players mode is a mode in which the game is played with using two combinations of the indicator 65 and the operating section 12. Hereinafter the single player mode will be represented as 1P mode and the two players mode will be represented as 2P mode.

[0083] In the game machine 1, the entire game is divided into a plurality of stages and the game play is advanced stepwise with one stage being as a unit. FIG. 11 shows one example of a combination of the stages. In this example, the game is advanced stepwise in six steps, that is, a training stage, one of stages A, B and C, a scratch stage, one of stages D and E, and one of stages F, G and H. Each stage features music, the genre of which is different from that of the other stage. For example, the stage A features TECHNO music, and the stage B features EURO BEAT music. The scratch stage is a special stage in which only the turntable input unit 14 is used for the performance operation. The combination of the stages may be changed. For example, the training stage may be omitted by a cancel operation.

[0084] FIG. 12 is a flow chart showing a procedure for one stage executed by the CPU 50. In this procedure, at least part of the music data and the performance data, each of which corresponds to the present stage, are loaded from the storage device 56 to the RAM 54 (step S1), and the contents of the stage are introduced to the player on the basis of the loaded data (step S2). For example, the genre of the music and the title thereof are displayed on the screen of the monitor 6, and a characteristic phrase of the music to be played in the current stage is played through the loud speakers 8A to 8C to thereby allow the player to understand the contents of the stage.

[0085] After introducing the stage, a predetermined start sign is given to the player through an image or sounds, and then the CPU 50 requests the sound processing unit 52 to start the play of the musical composition on the basis of the music data currently stored in the RAM 54 or the storage device 56 (step S3). As a result, the play of the predetermined music is started. After starting the play, positions of the index marks 68

and 69 in the indicator 65 are revised on the basis of a current play position of the music (step S4). This revision is cyclically repeated to move the marks 68 and 69 downward in the indicator 65 in accordance with the progress of the play of the music.

[0086] Next, the CPU 50 determines whether the operation timing of any one of the keys 15 and the slide disk 23 comes or not on the basis of the current play position of the music (refer to FIG. 7) and the performance data (step S5), and gives the player an indication of the operation timing, if the operation timing comes (step S6). The indication is carried out by changing the color of the mark 68 or 69 which has reached to the performance operation position PP in the indicator 65. If the operation timing of any one of the keys 15A to 15E comes, the indicating lamp 17 of the key 15 to be operated is turned on or blinked to show the player which key 15 should be operated.

[0087] After the timing indication, the CPU 50 judges whether any one of the keys 15A to 15E, the slide disk 23 and the push button switches 31A to 31C is operated or not (step S7). If judged that the operation is performed, the CPU 50 produces the performance effect corresponding to the operation (step S8). The performance effect may be producing a sound effect through the loud speakers 8A to 8C and blinking the illumination lamps 7A and 7B in association with the operation. The sound effect corresponding to each of the keys 15A to 15E and the push button switches 31A to 31C is determined as illustrated in FIG. 8, and the sound effect corresponding to the operation of the slide disk 23 is the above-mentioned scratch sound effect.

[0088] After producing the performance effect, the CPU 50 detects difference between the actual operation performed by the player and the operation defined by the performance data, especially with respect to the operation start time and the operation continuation time, and calculates a degree of accordance therebetween with using predetermined formulas to thereby estimate the operation of the player (step S9). The formulas are defined to decrease the degree of the accordance as the difference in the operation start time or continuation time increasing. If the operated key 15 or the slide disk 23 is different from the operation member designated by the indicator 65 to be operated, the degree of the accordance is not calculated, or the degree is calculated as a negative value.

[0089] If it is judged at the step S5 that the operation timing does not come, the CPU 50 omits the above-mentioned indication of the operation timing at the step S6, and judges whether any one of the keys 15A to 15E, the slide disk 23 and the push button switches 31A to 31C is operated or not (step S10). If judged that the operation is performed, the CPU 50 produces the performance effect corresponding to the operation (step S11). At this time, the performance effect may also be producing a sound effect through the loud speakers 8A to 8C, and blinking the illumination lamps 7A and 7B in asso-

ciation with the operation.

[0090] The sound effect produced at the step S11 is based on an adlib operation rather than an operation corresponding to the indication of the indicator 65. Therefore, it is not appropriate to estimate such an adlib operation on the basis of the degree of the accordance applied at the step S9. Accordingly, an adlib effect value is calculated at the step S12 to estimate the adlib operation by using formulas different from the formulas used at the step S9. The formulas used at the step S12 are adjusted to make a score higher as the adlib operation being judged as more timely and appropriate in view of current states of the music and the performance thereto. If the game is in the 2P mode, the degree of the accordance and the adlib effect value are calculated separately for each operation section 12. The calculation of the adlib effect value at the step S12 may be omitted; namely, the process may jump to the step S16 after producing the performance effect at the step S11.

[0091] After the calculation at the step S9 or S12, the CPU 50 calculates an amount of the groove gauge 61, that is, the length of the bar 61b and scores to be displayed in the score frames 62A and 62B on the basis of the result of the above-mentioned calculation (step S13). The amount of the gauge is calculated so as to change in accordance with the superiority of the performance operation performed by the payer. For example, if the degree of the accordance or the adlib effect value exceeds a predetermined reference level, the gauge amount increases in accordance with a margin from the reference level, while the gauge amount decreases in accordance with the margin if the degree of the value is under the reference level. Even if the 2P mode, the gauge bar 61b displayed in the groove gauge 61 is single, so that the gauge amount is calculated as a single value on the basis of each calculated result of the degree of the accordance and the adlib effect value for each operating section 12. On the other hand, the scores displayed in the score frames 62A and 62B are calculated separately for each operating section 12 by aggregating the degrees of the amount and the adlib effect values separately for each operating section 12. Therefore, if the two players simultaneously play the game, it is possible for the players to compete with each other for the high score.

[0092] After the calculation of the gauge amount and the scores, the CPU 50 revises display states of the groove gauge 61 and the score frames 62A and 62B in cooperation with the image processing unit 51, and then produces a reaction effect on the basis of the degree of the association or the adlib effect values calculated at the step S9 or S12. The reaction effect is aimed to give the player feeling of arranging the music as a DJ (Disc Jockey) in a discotheque or the like. Therefore, if the degree of the association or the adlib effect value is a high level, cheering sounds of the audience may be produced as the reaction effect, while booing sounds thereof may be produced if in the case of a low level. The

illumination lamps may be used to enhance the reaction effect.

[0093] After producing the reaction effect at the step S15 or judging at the step S7 or S10 that the operation is not performed, the CPU 50 judges whether the play of the music finishes or not (step S16), and if the play does not finish, the process returns to the step S4. If the play of the music finishes, the CPU 50 judges whether or not the player clears the stage in comparison with a predetermined condition (step S21). For example, the CPU 50 judges whether the stage is cleared or not in association with a judgement as to whether or not the amount of the groove gauge 61 at the end of the stage exceeds a predetermined level.

[0094] If it is judged that the stage is cleared, the CPU 50 displays on the screen of the monitor 6 an image informing the player that the stage is cleared, and also produces a predetermined reaction effect (step S22). For example, great cheering sounds of audiences are produced as the reaction. At the next step S23, the CPU 50 allows the player to advance to the next stage, and then finishes the process for the current stage. On the other hand, if it is judged at the step S21 that the stage is not cleared, the CPU 50 displays an image representing that the game is over and then finishes the process for the current stage.

[0095] Next, another embodiment of the present invention will be explained with reference to FIGS. 13 to 19. In this embodiment, the procedure during the game is changed from that of the above-mentioned embodiment of FIGS. 1 to 12, so that the following description will mainly be concerned with the difference against the above-mentioned embodiment.

[0096] In this embodiment, a plurality of musical compositions as the BGM to be used in the game are prepared similarly in the case of the above-mentioned embodiment. A data set illustrated in FIG. 13A is prepared for each musical composition and is stored in the auxiliary storage device 56. The data set for the musical composition X includes wave form data, wave form table data, and performance data.

[0097] As shown in FIG. 13B, the wave form data includes BGM data and sound effect data. The BGM data contains data defining wave form for reproducing the musical composition X, and the sound effect data contains data defining wave form of sound to be produced in response to operations to the keys 15 and the slide disk of the turntable input device 14. These data are prepared and stored, for example, as PCM or ADPCM data. The reason why the sound effect data is included in the data set for each musical composition is to produce sound effects appropriately for each genre of the BGM.

[0098] As shown in FIG. 13C, the wave form table data includes data tables for designating an address of the wave form data, a size of the wave form data, a pan pot (panning potentiometer), a port number and the like. The tables related to the address and the size contains information necessary for picking up the desirable BGM

data and the sound effect data from the above-mentioned wave form data. The table for the pan pot contains information necessary for designating which channel, that is, the left or right channel of the loud speakers 8A to 8C must be used to produce the BGM sound or the sound effect. Note that both channels can simultaneously be used, if necessary. The table of the port number contains information necessary for designating the number of the port through which the BGM data and the sound effect data are issued. Namely, in this embodiment, the sound processing unit 52 comprises a plurality of channels, for example 8 channels, to produce sounds, and one of the channels is selected, as a channel through which the wave form data is reproduced, in accordance with the designation of the port number. The information for designating the port number is included in the table of the port number.

[0099] As shown in FIG. 14, the performance data contains operation timing data, automatic play timing data, wave form number designation data, and tempo data. The operation timing data and the automatic play timing data are prepared as two sets, one of which is for an easy mode and the other of which is for a normal mode. The detail of the difference between both modes will be explained later.

[0100] The operation timing data is data in which operation timing of the keys 15 and the slide disk 23 with respect to the musical composition X are designated in association with times which will be passed from a start of the musical composition X. In other words, the operation timing data defines one of the operation members, i.e., the keys 15 and the slide disk 23, which is to be operated at a specific time during the game. Therefore, the operation timing data corresponds to the data which is prepared by encoding the time chart illustrated in FIG. 7 in association with the time passed from the start of the music. As is explained in FIG. 7, the operation timing data is prepared separately for each of the keys A to E and the turntable. The operation timing data provides bases of the display of the indicator 65 and of the judgement on the operations of the keys 15 and the slide disk 23. Since the musical composition X comprises a plurality of phrases, information corresponding to times at which the phrases are changed are included in the operation timing data.

[0101] The automatic play timing data is provided for producing performance sound effects unless any of the keys 15 and the slide disk 23 is operated, and defines designation of the sound effect which is to be produced at the specific time in the game. During the game play, the CPU 50 issues commands to the sound processing unit 52 so as to produce the designated sound effect at the time designated by the automatic play timing data. The reason why the automatic play timing data is provided will be explained later.

[0102] The wave form number designation data is data for designating the sound effect to be produced in response to the operation of each of the keys 15 and the

slide disk 23. The relationship between the operation of each key 15 and the sound effect to be produced in response to the operation may be fixed through the entire play of the musical composition X, or be changed every appropriate period, such as phrase shown in FIG. 8. In case that the sound effect is changed in the middle of playing the musical composition X, information for distinguish the relationship between the key 15 and the sound effect is recorded in the data in association with the time passed from the start of the music. The sound effect corresponding to the operation of the slide disk 23 may be the scratch sound effect or be another sound effect.

[0103] The tempo data is data for defining a tempo of the musical composition X. In case that the tempo is changed in the middle of playing the musical composition X, information for distinguish the tempo is recorded in the data in association with times passed from the start of the music. The game machine 1 controls the display range of the indicator 65 with reference to the tempo data.

[0104] FIG. 15 shows a relationship between a read range of the operation timing data and a display range of the indicator 65. During the game play, the RAM 54 (refer to FIG. 6) provides a pre-load buffer area for the operation timing data, and a part of the operation timing data which corresponds to a time period from the current time t_x to the time t_y is loaded into the pre-load buffer area. Note that, the current time t_x corresponds to a time which has currently passed from the start of the play of the music. Further, a part of the data which corresponds to a time period from the current time t_x to the time t_n ($>t_y$) is loaded from the pre-load buffer area into a display buffer area in the RAM 54. The time period between the times t_x and t_n corresponds to two measures of the musical composition X, and the length of time thereof changes in accordance with the tempo of the play of the musical composition X. Accordingly, the CPU 50 determines the time t_n , which is late from the current time t_x by two measures, with reference to the tempo data, and then loads the operation timing data between the times t_x and t_n , as the data necessary for displaying the indicator 65, into the display buffer area. After this, the CPU 50 performs calculations necessary for determining an arrangement of the index marks 68 and 69 in the indicator 65 on the basis of the operation timing data loaded in the display buffer area, and then produces image data for displaying the indicator 65 on the basis of the result of the calculations. The image processing unit 51 revises the image of the indicator 65 on the basis of the produced image data to thereby display the indicator 65 appropriate for the current time t_x . The time t_y may also be changed in accordance with the tempo of the musical composition X. The data loaded into the display buffer area is not limited to that corresponding to the two measures.

[0105] FIGS. 16 and 17 are flow charts showing a procedure for one stage executed by the CPU 50. In this

procedure, first of all, a mode select step in which the player is requested to select one of the easy mode and the normal mode is executed in an interactive manner through the monitor 6 (step S51). The easy mode is a mode in which the game is carried out on the basis of the operation timing data and the automatic play timing data for the easy mode (refer to FIG. 14), and the normal mode is a mode in which the game is carried out on the basis of the operation timing data and the automatic play timing data for the normal mode. In the easy mode, difficulty of the operation indicated through the indicator 65 is easier than that in the normal mode. For example, if the display of the indicator 65 at the specific time in the normal mode is set as illustrated in the left side of FIG. 18, some of the index marks 68' are omitted at the same time in the easy mode as illustrated by imaginary lines in the right side of FIG. 18. As a result, the total number of the index marks displayed in the easy mode through the entire play of the music composition is less than that in the normal mode. Therefore, the player can operate the keys 15 and the slide disk 23 with composure in comparison with the normal mode. FIG. 18 shows the arrangement of the marks 68 with respect only to three rows of the tracks, however, the omission of the marks may be performed in all of the tracks 66A to 66E and 67, or only in a part of the rows of the tracks.

[0106] In case that the display of the marks 68' is omitted in the easy mode, the player need not perform the operation corresponding to the omitted mark 68', so that the performance effect to be mixed with the BGM is not produced. Therefore, the performance of the music in the easy mode may be monotonous in comparison with that in the normal mode. In this case, there is a possibility that the interest of the game reduces. In order to avoid this situation, the automatic play timing data for the easy mode features commands to produce automatically the sound effect which corresponds to the omitted marks 68' at the timing when the mark 68' would reach to the performance operation position PP (refer to FIG. 10) if the display of the mark 68' were not omitted. Thus, in case that the automatic play timing data for each of the normal mode and the easy mode are compared with each other with respect to the same musical composition X, the number of commands to produce the sound effect issued on the basis of the data for the easy mode is greater than that for the normal mode. The automatic play timing data for the normal mode is not essential for the game. Therefore, it is possible to omit the automatic play timing data for the normal mode, and every sound effect with respect to the composition X may be produced only in response to the operations of the keys 15 and the slide disk 23.

[0107] After selecting the mode at the step S51 of FIG. 16, the CPU 50 sequentially loads the wave form data and the wave form table data associated with the music assigned to the current stage (steps S52, S53). These data are common to both of the easy mode and the normal mode. Next at the step S53, the CPU 50 judges

whether the easy mode is selected or not. If the normal mode is selected, the CPU 50 loads the operation timing data and the automatic play timing data for the normal mode (step S55). On the contrary, if the easy mode is selected, the CPU 50 loads the operation timing data and the automatic play timing data for the easy mode (step S56).

[0108] After loading the data at the step S55 or S56, the CPU 50 introduces the contents of the stage to the player (step S59), and then starts the play of the music (step S60). These steps are similar to the above-mentioned step S2 or S3 in FIG. 12. Simultaneously with the start of the music, the CPU 50 starts clocking to watch the current time tx (FIG. 15), that is, the time currently passed from the start of the music play. Next at the step S61, the CPU 50 obtains the data for the indicator. Namely, the operation timing data from the current time tx to the time ty is loaded into the pre-read buffer area in FIG. 15, and then the data from the current time tx to the time tn which corresponds to two measures of the music is loaded into the display buffer area.

[0109] Next at the step S62, the CPU 50 judges whether a random mode is currently selected or not. If the random mode is selected, the CPU 50 changes the relationship between the operation timing data loaded into the display buffer area and the key tracks 66A to 66E for changing the display of the marks 68 in the indicator 65 in such a manner that the arrangement of the marks 68 is reversed in the lateral direction with the center track 66C being as an axis in comparison with the arrangement in a non-random mode as illustrated in FIG. 19 (step S63). After this, the procedure proceeds to the step S64. Note that, FIG. 19 shows only three rows of the tracks 66B, 66C and 66D, however, the marks 68 in the left and right end tracks 66A and 66E are exchanged with each other. The relationship between each of the tracks 66A to 66E and the marks 68 in the random mode is not limited to the embodiment in which the arrangement of the marks 68 is reversed in the lateral direction against the non-random mode. For example, the each marks 68 may be deviated by one row in the lateral direction, or exchanged between any two tracks, and various changes with respect to the arrangement of the marks 68 may be applied in the random mode.

[0110] The reason why the random mode is prepared is as follows. In the game machine 1, the player will learn the sequence of the operation of the keys 15 through repeating the play of the same music, and will be able to play the appropriate set of operations without checking the display in the indicator 65. In this case, there is a possibility that the difficulty of the game relatively reduces and the player loses the interest in the game. However in the game machine 1 of this embodiment, since the arrangement of the marks 68 is reversed in the lateral direction in the random mode, it is possible to throw the player into confusion such that the indicator 65 indicates the operation of the key 15E when the play-

er expects to operate the key 15A in accordance with his memory. Therefore, it is possible to prevent the player from being skilled in the operation and to prevent the decrease of the difficulty of the game, thereby keeping the interest of the player in the game for a long time. The random mode may be selectable by the player, or the game machine 1 automatically select the random mode when a predetermined condition is satisfied. For example, if the player gets a result which exceeds the predetermined level in the past stages, the game machine 1 will automatically select the random mode for the next stage. The game machine 1 may comprise a clock circuit and select the random mode in the specific time zone in a day. The judgement as to whether or not the game is currently in the random mode may be carried out, for example, by using a flag and distinguishing the value thereof.

[0111] On the other hand, if it is judged at the step S62 that the game is not in the random mode, the process proceeds to the step S64 with omitting the step S63. At the step S64, the CPU 50 revises the positions of the marks 63 and 69 in the indicator 65 on the basis of the data loaded into the display buffer area. The marks 68 and 69 can be moved downward in the indicator 65 in accordance with the progress of the play of the music by cyclically repeating the revision of the display of the marks. After the step S64, the process proceeds to the step S65 in the FIG. 17.

[0112] At the step S65, the CPU 50 judges whether the operation timing of each of the keys 15 and the slide disk 23 comes or not on the basis of the current time and the operation timing data. At this step, if the current time is in a time range which is set so as to include operation timing designated by the operation timing data and to have a predetermined width, it is possible to consider the current time as the operation timing. If it is judged that the operation timing comes, the CPU 50 gives the player the indication of the operation timing similarly at the step S6 in FIG. 6 (step S67). After the indication of the operation timing, the CPU 50 judges whether any one of the keys 15A to 15E, the slide disk 23 and the push button switches 31A to 31C is operated or not in the above-mentioned time range. If it is judged that the operation is performed, the CPU 50 produces the performance effect corresponding to the operation (step S69). The performance effect at this step may be producing sound effect through the loud speakers 8A to 8C, and blinking the illumination lamps 7A and 7B in association with the operation performed by the player. The relationship between the operation of each operation member, that is, the keys 15A to 15E, and the push button switches 31A to 31C, and the sound effect is set as illustrated in FIG. 8. If in the random mode, the relationship between each key 15 and the sound effect is changed similarly to the display arrangement of the indicator 65. For example, if the key 15E is operated in the random mode, the CPU 50 considers the operation to be an operation of the key 15A and produces the

sound effect assigned to the key A in FIG. 8.

[0113] After producing the performance effect, the CPU 50 calculates the degree of the accordance between the operation of the player and the operation timing defined by the operation timing data similarly at the step S9 in FIG. 12 (step S70). At this step, if the game is in the random mode, the relationship between each of the keys A to E illustrated in FIG. 7 and each of the keys 15A to 15E is changed similarly to the display arrangement of the indicator 65. For example, if the key 15E is operated in the random mode, the CPU 50 considers the operation to be an operation of the key 15A and compares the operated time with the operation timing with respect to the key A illustrated in FIG. 7.

[0114] If it is judged at the step S65 that the operation timing does not come, the CPU 50 omits the above-mentioned indication of the operation timing, and judges whether any one of the keys 15A to 15E, the slide disk 23 and the push button switches 31A to 31C is operated or not (step S74). If it is judged that the operation is performed, the CPU 50 produces the performance effect corresponding to the operation (step S75). At this time, the performance effect may also be producing sound effect through the loud speakers 8A to 8C, and blinking the illumination lamps 7A and 7B performed in association with the operation of the player. After this, the CPU 50 calculates the adlib effect value similarly at the step S12 of FIG. 12.

[0115] After the calculation at the step S70 or S76, the CPU 50 calculates the amount of the groove gauge 61, that is, the length of the bar 61b and scores to be displayed in the score frames 62A and 62B on the basis of the result of the above-mentioned calculation (step S77). This step is similar to the step S12 in FIG. 13. After the calculation, the CPU 50 revises display states of the groove gauge 61 and the score frames 62A and 62B on the basis of the calculated result (step S78), and then produces the reaction effect on the basis of the degree of the association or the adlib effect value calculated at the step S70 or S76 (step S79). This step is similar to the step S15 in FIG. 15. After producing the reaction effect, or judged at the step S68 or S74 that the operation is not performed, the CPU 50 judges whether the play of the music finishes or not (step S80), and if the play does not finish, the process returns to the step S61 in FIG. 16. If the play of the music finishes at the step S80, the CPU 50 judges whether the player clears the stage or not similarly at the step S21 in FIG. 12 (step S81). If it is judged that the stage is cleared, the CPU 50 displays the image informing the player that the stage is cleared as in the case at the step S22 in FIG. 12, and also produces the predetermined reaction effect (step S82).

[0116] At the next step S83, the CPU 50 allows the player to advance to the next stage, and then finishes the process for the current stage. On the other hand, if it is judged at the step S81 that the stage is not cleared, the CPU 50 displays an image representing that the game is over (step S84), and then finishes the process

for the current stage. In this case, since the advance to the next stage is not allowed, the game is finished.

[0117] The present invention is not limited to the above embodiments, and is carried out in various embodiments. For example, the turntable input unit 14 may be provided with a motor connected with the rotary shaft 22 through a slide type clutch to rotate the slide disk 23 during the game play, thereby imitating the rotation of the phonograph record disk. In this case, the manual operation of the slide disk 23 performed by the player causes the acceleration of the slide disk 23 which can be detected on the basis of the signals issued from the sensors 27A and 27B; therefore it is possible to produce and change the scratch sound effect in accordance with the acceleration of the slide disk 23. The game machine 1 may be provided with a communication device, and the music data and the performance procedure data stored in the auxiliary storage device 56 may be rewritten at any time from a remote location. This case allows the game machine 1 to always provide the player with up-to-date music.

[0118] The display manner of the index marks 68 and 69 in the indicator 65 may be changed besides the above-mentioned embodiments. FIG. 20 shows an example in which a hidden mode is prepared. In the hidden mode, after each of the marks 68 and 69 reaches to a position HD in the indicator 65, at least a part of the marks 68 and 69 is hidden as illustrated by imaginary lines and denoted by a reference numeral 68'. However, the estimation of the operation is determined in the same way as that in a non-hidden mode. Therefore, in order to clear the stage, the player has to operate keys 15 with expecting the timing at which the hidden marks 68' will reach the performance operation position PP. Accordingly, the difficulty of the game increases. Such control in the hidden mode can be carried out by the steps of: deleting the designations of the operation timing, which is included in a range from the current time to a time corresponding to the position HD of the indicator 65, with respect to the operation timing data loaded into the display buffer area, and comparing the actual operation performed by the player with the operation timing data originally recorded in the performance data (refer to FIG. 13A) at each step for estimating the operation, for example, at the step S70, S76 or S77 in FIG. 17. FIG. 20 shows the marks 68 for the key tracks 15, however, the hidden mode may be applied to the marks 69 in the turntable track 67.

[0119] FIG. 21 shows an embodiment in which the configurations of the operating sections 12A and 12B are modified. In this embodiment, the operating sections 12A and 12B are arranged symmetrically in the lateral direction of the control panel 10. Namely, the turntable input unit 14 is disposed at the left side of the keyboard input device 13 in the left side operating sections 12A, while the unit 14 is disposed at the right side of the unit 13 in the right side operating section 12B. According to this arrangement, in case that the single player inserts coins

enough for two players and selects the 2P mode, the two sections 12A and 12B are arranged in the lateral direction near the hands of the player who stands at the center position of the game machine 1 in the lateral direction thereof, so that the player can easily operate the operating members in both of the sections 12A and 12B. In the embodiment of FIG. 21, the number of the keys 15 in each section 12 is changed to seven. However, the present invention is not limited to the embodiment of providing each section 12 with the five or seven keys 15, the number of the keys 15 may be changed variously.

[0120] Besides the keys 15 and the slide disk 23, the operation input device may be provided with a slide type volume switch 80 illustrated in FIG. 22. The switch 80 comprises a slit 81 extending in the vertical direction of FIG. 22 and a knob 82 slidably operable along the slit 81, and is capable of issuing signals corresponding to the position of the knob 82. The slide type volume switch 80 may be used as an operation member for mixing the BGM or the sound effect added thereon with another special effect. The special effect may include a so-called surround effect, a change of the musical key, a cutting of a vocal part from the BGM, and an equalizing effect for high or low frequency band. The degree of addition of these effects may be changed in accordance with the position of the knob 82. In one preferable example of using the slide type volume switch 80, the movable range of the knob 82 is divided into a plurality of sections, e.g. five sections, and the CPU 50 detects which section the knob 82 is located in. Then, the CPU 50 changes the degree of addition of the special effect in accordance with the location of the knob 82. A plurality of the slide type volume switches 80 may be provided in the game machine 1.

[0121] FIGS. 23A and 23B show an embodiment in which the positions of the indicators 65A and 65B in the screen are changeable. In this embodiment, two modes are provided with respect to the display of the indicators 65. In one mode, the indicators 65A and 65B are displayed at the both ends of the screen in the lateral direction thereof (refer to FIG. 23A) and in the other mode, the indicators 65A and 65B are displayed so as to be arranged side by side at the center of the screen (refer to FIG. 23B). The latter mode has the advantage that the player who stands at the center of the game machine 1 can easily confirm both indicators 65A and 65B, and this arrangement may be most effective when the single player selects the 2P mode. In case that the coins are enough for two players and are inserted at the start of the process of FIG. 12 or FIG. 16, the process may further comprise a step for requesting the player to select one mode among the 1P mode, a 2P mode for a single player and a 2P mode for two players, and the CPU 50 may control the process in such a manner that the mode of FIG. 23A is automatically selected in response to the selection of the 1P mode or the 2P mode for the two players, while the mode of FIG. 23B is automatically se-

lected in response to the selection of the 2P mode for the single player. The mode of FIG. 23B and the arrangement of FIG. 21 may be associated with each other to thereby provide the player with comfortable operation environment.

[0122] In the above-mentioned embodiment, the data concerning the performance procedure, for example the performance data of FIG. 14, is prepared separately for each of the performance operating sections 12A and 12B, and the two players operate the respective input units 13 and 14 to complete the performance of the BGM in cooperation with each other. However, the present invention is not limited to such a manner. The same data for the performance procedure may be used for both operating sections 12A and 12B, the indicators 65A and 65B may indicate the same operation, and the operations may be estimated separately for each of the sections 12A and 12B to separately display the estimated scores in the respective score frames 62A and 62B. In this case, it is possible to provide the two players with pleasure of competing with each other for the high score similarly in case of a so-called battle fighting game. Also, it is not necessary to define a plurality of the performance procedures in the performance data for one piece of the BGM, and this fact causes the performance data to decrease its size. Therefore, if a capacity of the auxiliary storage device 56 which can be used for the data is restricted, it is possible to increase the numbers of the music stored in the restricted capacity. Thus, it is possible to increase, for example, the numbers of the stages shown in FIG. 11.

[0123] In the above mentioned embodiment, the CPU 50 works as various devices necessary for processing the game by being combined with a particular software, however a part or all of the devices can be replaced with a logical circuit.

Claims

1. A music action game machine comprising:

a main body;
an operation input device disposed on a front side of the main body so as to be adjacent to hands of a player facing the front side of the main body, the operation input device having a plurality of operation members;
a storage device for storing data of a musical composition and data of a performance procedure associated with the musical composition;
a music play device for playing the musical composition based on the data stored in the storage device;
an operation instructing device for giving the player a visual instruction to operate the operation members in accordance with progress of a play of the musical composition based on the

data stored in the storage device;
an effect producing device for producing a performance effect in response to a performance operation performed by the player to each of the operation members;
an estimation device for estimating the performance operation of the player based on a relationship between the performance procedure defined by the data stored in the storage device and the performance operation of the player; and
an estimation informing device for informing the player of an estimation result determined by the estimation device.

2. A music action game machine according to claim 1, wherein the operation input device comprises a disk-shaped operation member as one of the operation members, the disk-shaped operation member being operable so as to be turned about an axis thereof.
3. A music action game machine according to claim 2, wherein the effect producing device produces a scratch sound effect as the performance effect in response to a turning operation of the disk-shaped operation member, said scratch sound effect being similar to an actual scratch sound produced by irregularly turning a phonograph record disk with keeping contact between the phonograph record disk and a stylus of a phonograph player.
4. A music action game machine according to claim 1, wherein the operation instructing device comprises:

an indicator disposed on the front side of the main body and provided with at least one track extending in a predetermined direction; and
a mark indicating device capable of indicating index marks, each of which is provided for indicating operation timing of each of the operation members, in such a manner that each of the index marks moves along the track and then reaches to a fixed operation position defined in the track when the operation timing associated with each of the index marks comes.

5. A music action game machine according to claim 4, wherein the mark indicating device changes a length of each of the index marks in said predetermined direction in accordance with a length of an operation continuation time during which each of the operation members must be operated.
6. A music action game machine according to claim 4, wherein a plurality of tracks is provided as said at least one track, said tracks being arranged side by

side with each other so as to accord with an arrangement of the operation members.

7. A music action game machine according to claim 1, wherein an illumination device is provided on the front side of the main body, and the effect producing device controls an illumination of the illumination device in response to the performance operation of the player. 5
8. A music action game machine according to claim 7, wherein a loud speaker is provided on the front side of the main body, and the illumination device comprises a loud speaker illuminator surrounding an outer periphery of the loud speaker. 10 15
9. A music action game machine according to claim 1, wherein a relationship between each of the operation members and the performance effect to be produced in response to the operation thereto is changed in accordance with the progress of the play of the musical composition. 20
10. A music action game machine according to claim 1, wherein the estimation device estimates the performance operation each time the performance operation is actually performed during the play of the musical composition, and the estimation informing device informs the estimation result each time the estimation device determines the estimation result. 25 30
11. A music action game machine according to claim 1, wherein the estimation device estimates the performance operation with referring to a relationship between the performance procedure stored in the storage device and a length of an operation continuation time during which each of the operation members must be operated. 35
12. A music action game machine according to claim 1, wherein: 40
 - the main body has a plurality of operating sections, each of which is provided with the operation input device;
 - the estimation device estimates the performance operation separately for each of the operating sections; and
 - the estimation informing device informs the estimation result separately for each of the operating sections. 45 50
13. A music action game machine according to claim 1, wherein the estimation device calculates a score in accordance with superiority of the performance operation, and the estimation informing device informs the calculated score. 55

14. A music action game machine according to claim 1, wherein:

the data storage device stores a plurality of data sets, each of which includes the data of the musical composition and the data of the performance procedure; and
 said game machine further comprises a stage progress management device for controlling progress of a game in such a manner that when the estimation device gives a predetermined level of estimation with respect to the performance operation in one stage in which the musical playing device plays the musical composition based on one of the data sets, the game is allowed to progress to a next stage in which the music play device plays the musical composition and the instructing device instructs the performance operation based on another one of the data sets.

15. A music action game machine according to claim 14, wherein the effect producing device produces a reaction effect as one type of the performance effect when the game reaches to an end of said one stage, the reaction effect being changed in accordance with the estimation result at the end of said one stage.
16. A music action game machine according to claim 1, wherein the operation instructing device makes a decision as to whether or not operation timing of each of the operation members comes, and instructs the performance operation to the player in a different visual manner in accordance with a result of said decision.
17. A music action game machine according to claim 1, wherein the estimation device makes a decision as to whether or not operation timing of each of the operation members comes, and estimates the performance operation when it is judged that the operation timing comes.
18. A music action game machine according to claim 1, wherein the operation instructing device makes a decision as to whether or not operation timing of each of the operation members comes, and changes a standard, with which the performance operation is estimated, in accordance with a result of said decision.
19. A music action game machine according to claim 1, wherein the estimation device estimates the performance operation based on a difference between timing of the performance operation defined by the data of the performance procedure and timing at which the player actually performed the perform-

ance operation.

20. A music action game machine according to claim 1,
wherein the effect producing device produces ef-
fects different from each other in response to re-
spective operations of the operation members,
each of the effects corresponding to said perform-
ance effect. 5
21. A music action game machine according to claim
10, wherein the effect producing device produces a
reaction effect as one type of the performance effect
each time the estimation device determines the es-
timation result, the reaction effect being changed in
accordance with the estimation result. 15
22. A music action game machine according to claim 1,
wherein the effect producing device produces a pre-
determined sound effect so as to remix sounds of
the musical composition with the sound effect in ac-
cordance with the performance operation. 20
23. A music action game machine comprising:
- a main body; 25
 - an operation input device disposed on a front
side of the main body so as to be adjacent to
hands of a player facing the front side of the
main body, the operation input device having a
plurality of operation members; 30
 - a storage device for storing data of a perform-
ance procedure associated with a predeter-
mined musical composition;
 - an operation instructing device for giving the
player a visual instruction to operate the oper-
ation members based on the data of the per-
formance procedure stored in the storage de-
vice; 35
 - an effect producing device for producing a per-
formance effect in response to a performance
operation of the player to each of the operation
members; 40
 - an estimation device for estimating the per-
formance operation of the player based on a re-
lationship between the performance procedure
defined by the data stored in the storage device
and the performance operation of the player; 45
 - and
 - an estimation informing device for informing the
player of an estimation result determined by the
estimation device. 50
24. A music action game machine comprising:
- an operation input device having a plurality of
the operation members and capable of issuing
operation input signals different from each oth-
er in accordance with each of operations to the 55

operation members;

a storage device for storing data of a musical
composition, data of a performance procedure
with respect to each of the operation members
of the operation input device, and data of sound
effects corresponding to each of the operation
members;

a music play device for playing the musical
composition based on the data of the musical
composition stored in the storage device;

an performance procedure presenting device
for presenting the player with the performance
procedure in a visual manner in association
with a play of the musical composition based
on the data of the performance procedure
stored in the storage device,;

a sound effect producing device for producing
the sound effects based on the operation input
signals issued from the operation input device
and the data of the sound effects stored in the
storage device;

an estimation device for estimating operations
of the player based on the operation input sig-
nals issued from the operation input device and
the data of the performance procedure stored
in the storage device; and

an estimation informing device for informing an
estimation result determined by the estimation
device.

25. A music action game machine according to claim 1,
wherein:

the storage device stores a data set including
the data of the musical composition and a plu-
rality of operation data sections associated with
the musical composition, each of the operation
data sections corresponding to the data of the
performance procedure;

at least one of the operation data sections is
prepared so as to make difficulty with respect
to the performance procedure defined thereby
easier than that defined by another one of the
operation data sections; and

the operation instructing device selects any one
of the operation data sections and instructs the
player to operate the operation members based
on said selected one of the data sections.

26. A music action game machine according to claim
25, wherein the performance procedure defined by
said at least one of the operation data sections is
substantially equal to a procedure in which a part of
operations to the operation members is omitted in
comparison with the performance procedure de-
fined by said another one of the operation data sec-
tions.

27. A music action game machine according to claim 26, wherein:

the storage device stores automatic play data for producing the performance effect corresponding to each of the operations which are omitted in comparison with the performance procedure defined by said another one of the operation data sections; and

the game machine further comprises an automatic play device capable of producing the performance effect based on the automatic play data independently of the performance operation of the player.

28. A music action game machine according to claim 1, further comprising an operational relationship control device for changing a relationship between operations of the operation members defined by the data of the performance procedure and the operation members which are designated to be operated through the instruction of the operation instructing device with respect to the same musical composition

29. A music action game machine according to claim 1, wherein the operation instructing device comprises:

an indicator disposed on the front side of the main body, at least one part of the indicator being provided with a plurality of tracks which extend in a predetermined direction and which correspond to the operation members, respectively; and

a mark indicating device capable of indicating index marks, each of the index marks corresponding to each operation timing of the operation members which will come in a certain period from a present to future in a game, and the index marks being disposed in the tracks so as to be arranged from a predetermined position toward one side of the predetermined direction in accordance with time order therebetween.

30. A music action game machine according to claim 29, wherein the mark indicating device is capable of changing an indication manner of the index marks between a first mode and a second mode, the first mode being prepared to set a relationship between the index marks and the tracks equal to a relationship between the operation members and the operation timing defined by the data of the performance procedure, and a second mode being prepared to set the relationship between the index marks and the tracks in a different manner from that of the first mode.

31. A music action game machine according to claim

30, wherein the estimation device estimates the performance operation with interpreting that a relationship between the operation timing of each of the operation members defined by the data of the performance procedure and the performance operation to each of the operation members is changed in accordance with the relationship between the index marks and the tracks when in the second mode.

32. A music action game machine according to claim 29, wherein the mark indicating device is capable of selecting a third mode in which the index marks are hidden in a specific range which extends from the predetermined position in the tracks toward said one side of the predetermined direction.

33. A music action game machine according to claim 1, wherein:

the main body has a plurality of operating sections, each of which is provided with the operation input device;
the operation instructing device is capable of instructing the same performance procedure to each of the operating sections with respect to the same musical composition;
the estimation device estimates the performance operation separately for each of the operating sections; and
the estimation informing device informs the estimation result separately for each of the operating sections.

34. A music action game according to claim 1, wherein:

the main body is provided with a plurality of operating sections arranged in a lateral direction thereof, each of the operating section being provided with the operation input device;
the front side of the main body is provided with a display device for displaying a game image; and
the operation instructing device is capable of changing a display manner of the display device between a first display mode and a second display mode, the first display mode being prepared to display images for indicating timing of the performance operation on a screen of the display device with leaving a space between each of the images in the lateral direction in accordance with an arrangement of the operating sections, and the second display mode being prepared to display the images for indicating timing in such a manner that a space therebetween is less than that in the first display mode.

35. A music action game machine according to claim 1, wherein each of the data of the musical composition

and the data of the performance effect is stored in the storage device as PCM data.

36. A performance operation instructing system, which instructs a player to operate at least one operation member at a predetermined timing in association with progress of a play of a predetermined musical composition, comprising:

an indicator provided with at least one track extending in a predetermined direction; and a mark indicating device capable of indicating index marks, each of which is provided for indicating operation timing of the operation member, in such a manner that each of the index marks moves along the track and then reaches to a fixed operation position defined in the track when the operation timing associated with each of the index marks comes.

37. A performance operation instructing system according to claim 36, wherein the mark indicating device changes a length of each of the index marks in said predetermined direction in accordance with a length of an operation continuation time during which the operation member must be operated.

38. A performance operation instructing system according to claim 36, wherein a plurality of operation members is provided as said at least one operation member, and a plurality of tracks is provided as said at least one track, said tracks being arranged side by side with each other so as to accord with an arrangement of the operation members.

39. A storage device readable by a computer which stores data defining a procedure for operating operation members provided in a game system in association with a predetermined music, and a program for instructing a player to operate the operation members through a screen of a display device provided in the game system, said program being prepared for causing the computer to execute steps of:

displaying an image of an instruction on the screen of the display device to operate the operation members based on the data defining the procedure;
producing a performance effect in response to an operation of the operation members performed by the player;
estimating the operation of the operation members based on a relationship between the data defining the procedure and the operation performed by the player; and
informing a result of said estimating step to the player.

40. A storage device readable by a computer which stores data defining a procedure for operating operation members provided in a game system in association with a predetermined music, data of sound effects to be produced in association with operation input signals issued from the operation members in response to operations thereof, and a program for instructing a player to operate the operation members through a screen of a display device provided in the game system, said program being prepared for causing the computer to execute steps of:

displaying an image of an instruction on the screen of the display device to operate the operation members based on the data defining the procedure;
producing at least one of the sound effects based on the operation input signals issued from the operation members and the data of the sound effects;
estimating operations performed by the player based on the operation input signals issued from the operation members and the data defining the procedure; and
informing a result of said estimating step to the player.

41. A storage device readable by a computer which stores a program for giving a player an instruction to operate at least one operation member provided in a game system at a predetermined timing in association with progress of a play of a predetermined musical composition, said instruction being given through a screen of a display device provided in the game system, and said program being prepared for causing the computer to execute steps of:

displaying an indicator on the screen of the display device, said indicator being provided with at least one track extending in a predetermined direction; and
indicating index marks, each of which is provided for indicating operation timing of the operation member, in such a manner that each of the index marks moves along the track and then reaches to a fixed operation position defined in the track when the operation timing associated with each of the index marks comes.

FIG. 1

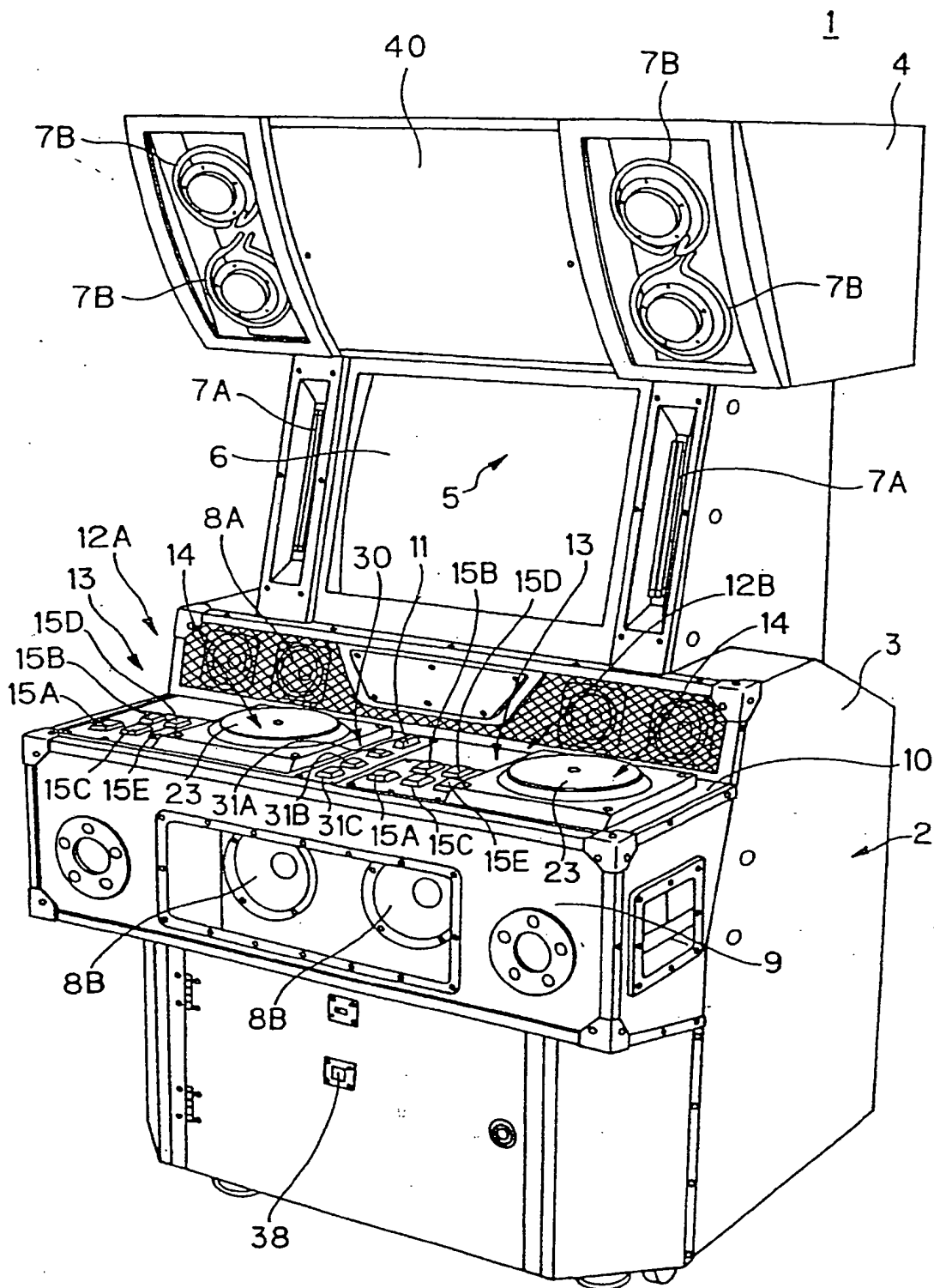


FIG. 2

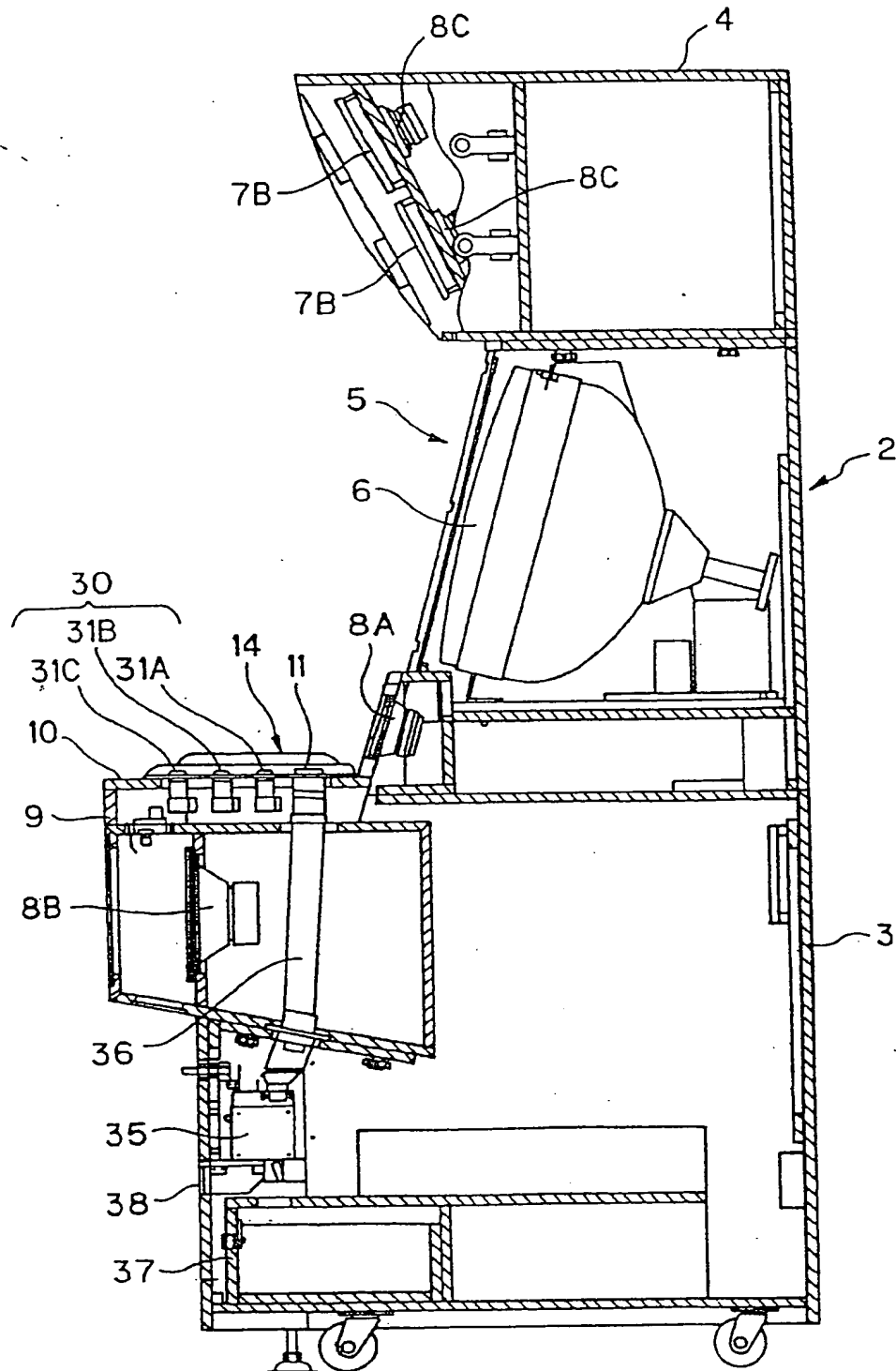


FIG. 3

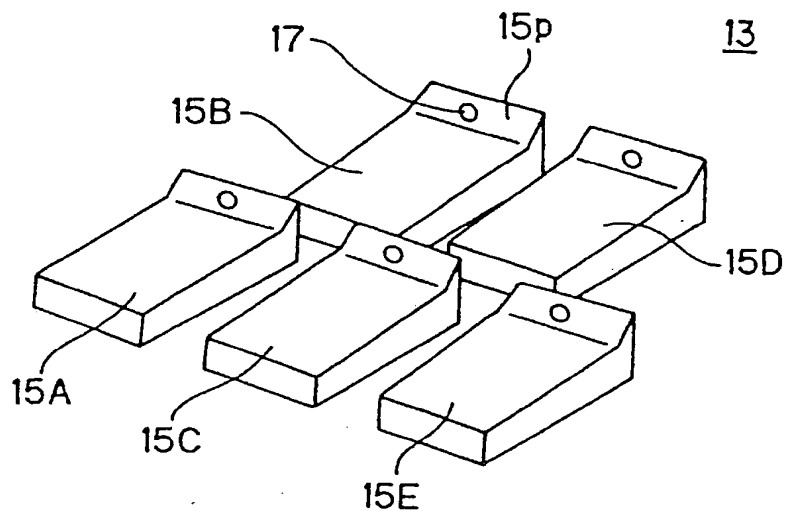


FIG. 4

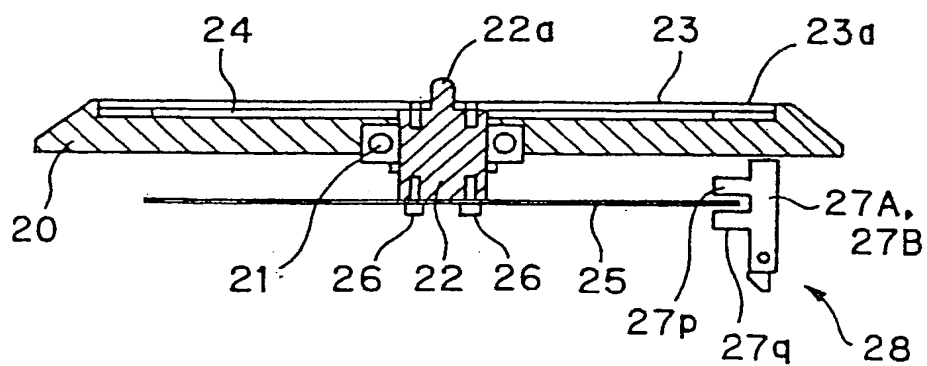


FIG. 5A

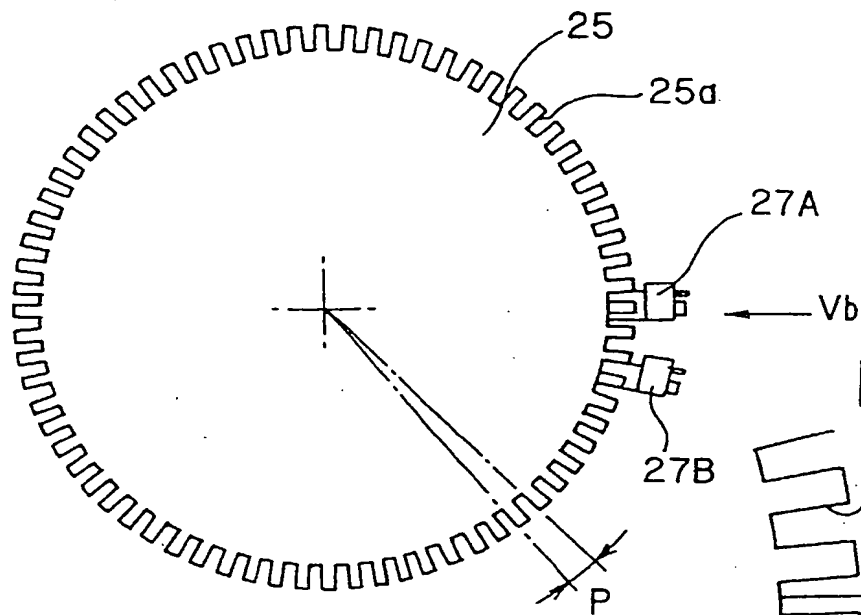


FIG. 5B

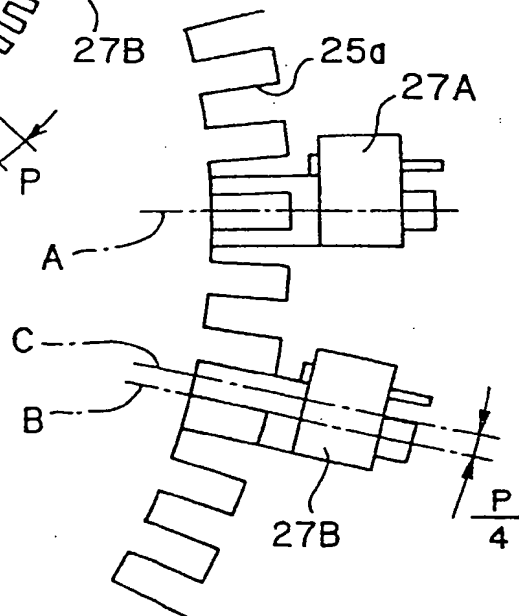


FIG. 6

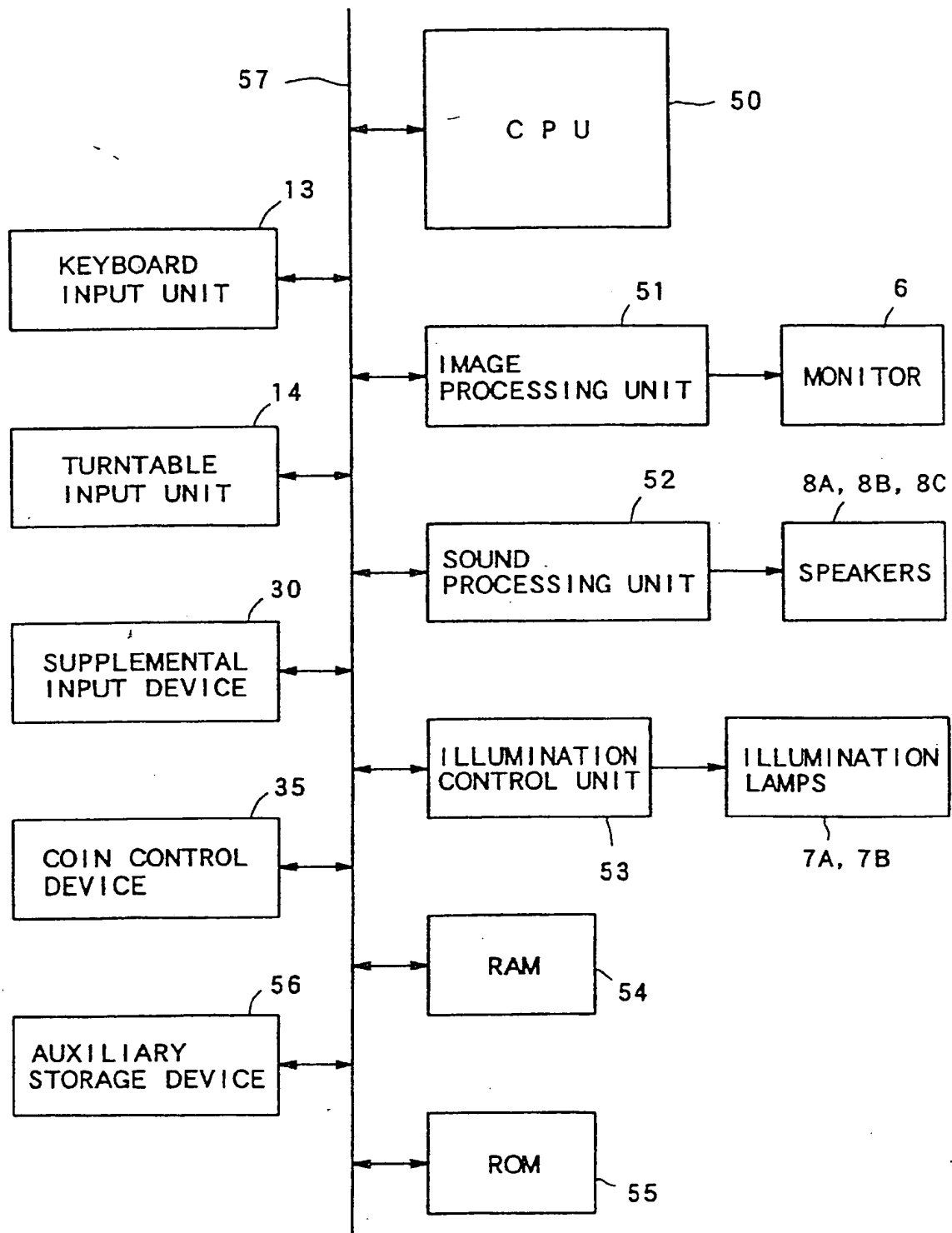


FIG. 7

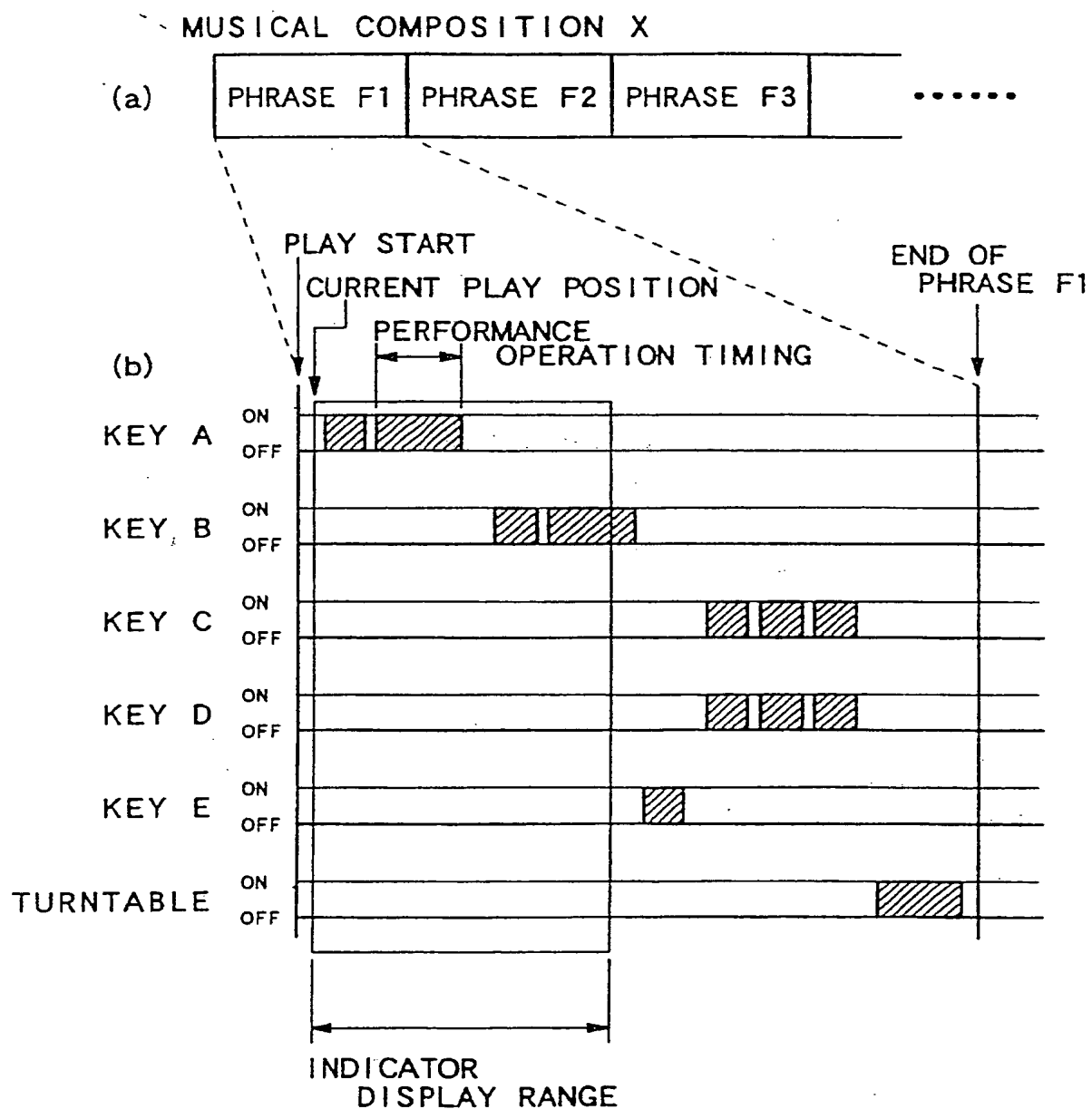


FIG. 8

MUSICAL COMPOSITION X

TB

OPERATION MEMBERS	PHRASE F1	PHRASE F2	PHRASE F3	
KEY A	SOUND EFFECT 1	SOUND EFFECT 11	SOUND EFFECT 1	
KEY B	SOUND EFFECT 2	SOUND EFFECT 12	SOUND EFFECT 2	
KEY C	SOUND EFFECT 3	SOUND EFFECT 13	SOUND EFFECT 3	
KEY D	SOUND EFFECT 4	SOUND EFFECT 14	SOUND EFFECT 4	
			
KEY E	SOUND EFFECT 5	SOUND EFFECT 15	SOUND EFFECT 5	
ADLIB KEY A	SOUND EFFECT 6	SOUND EFFECT 16	SOUND EFFECT 16	
ADLIB KEY B	SOUND EFFECT 7	SOUND EFFECT 17	SOUND EFFECT 17	
ADLIB KEY C	SOUND EFFECT 8	SOUND EFFECT 18	SOUND EFFECT 18	

FIG. 9

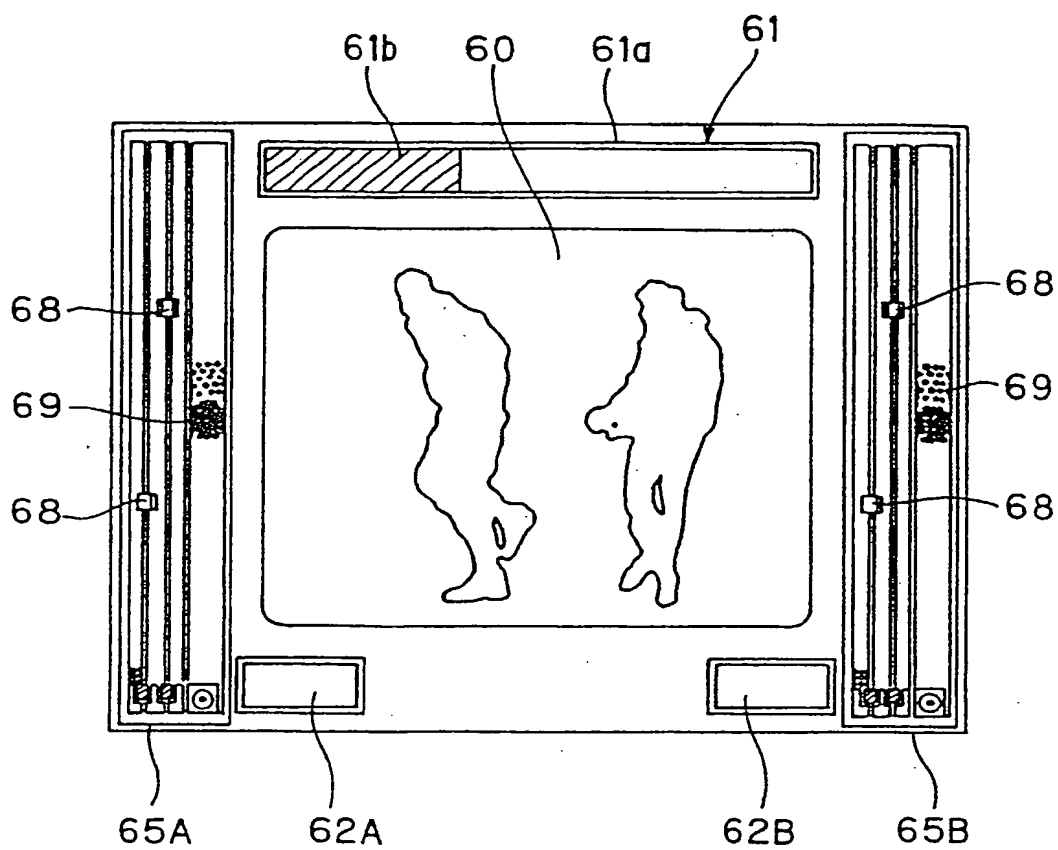


FIG. 10

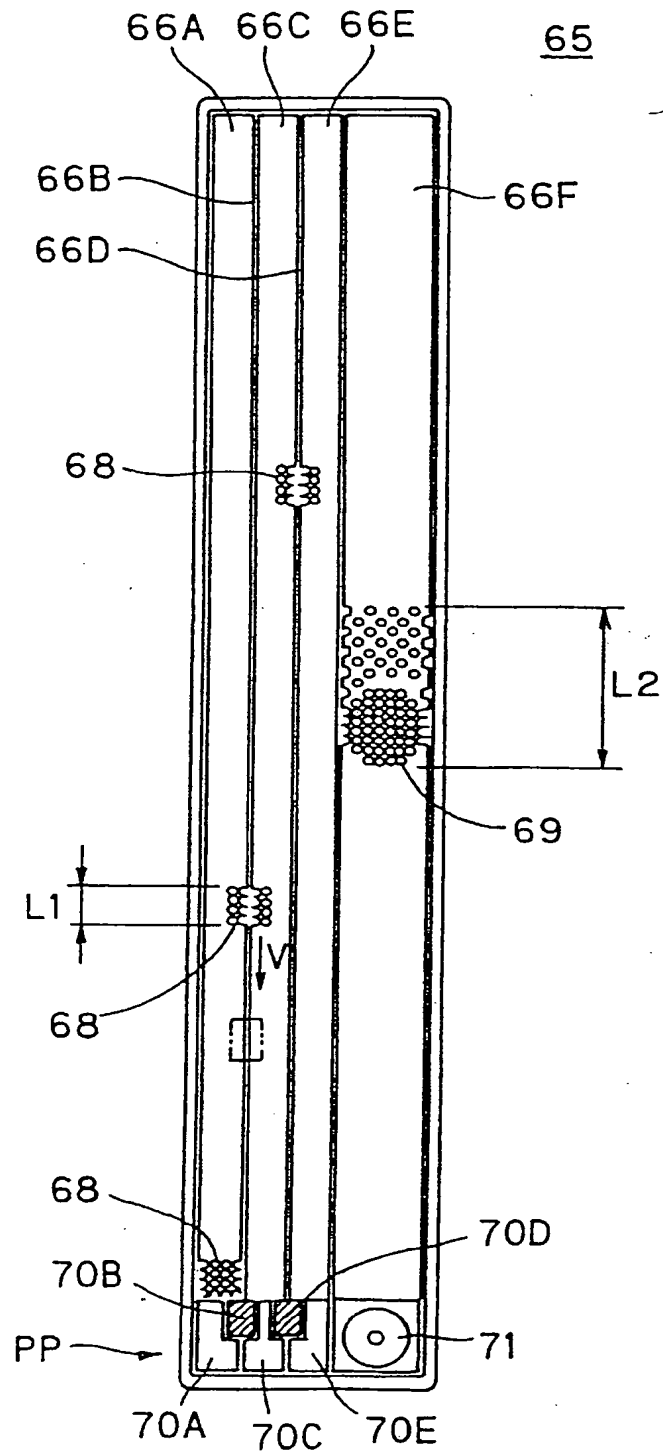


FIG.1 1

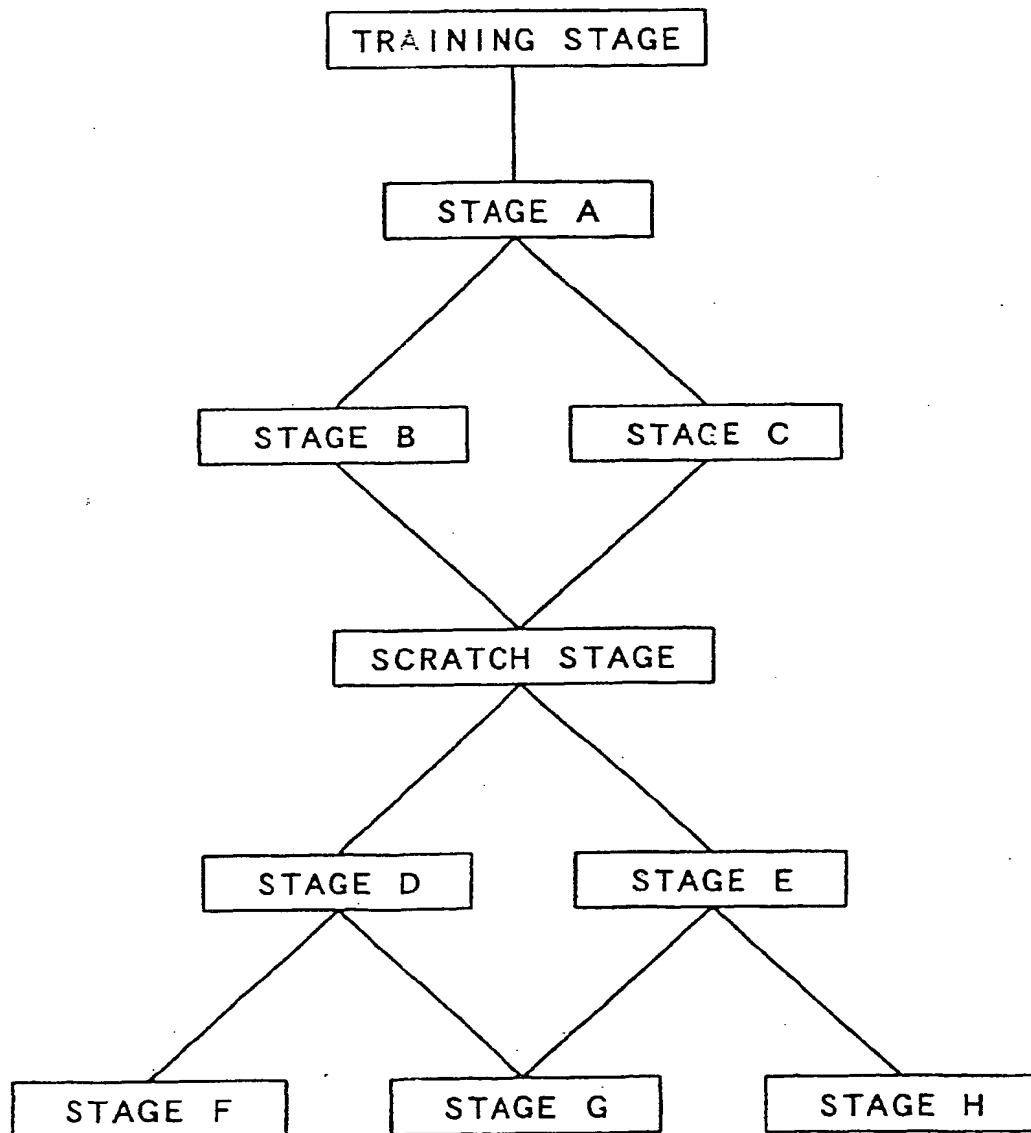


FIG. 1 2

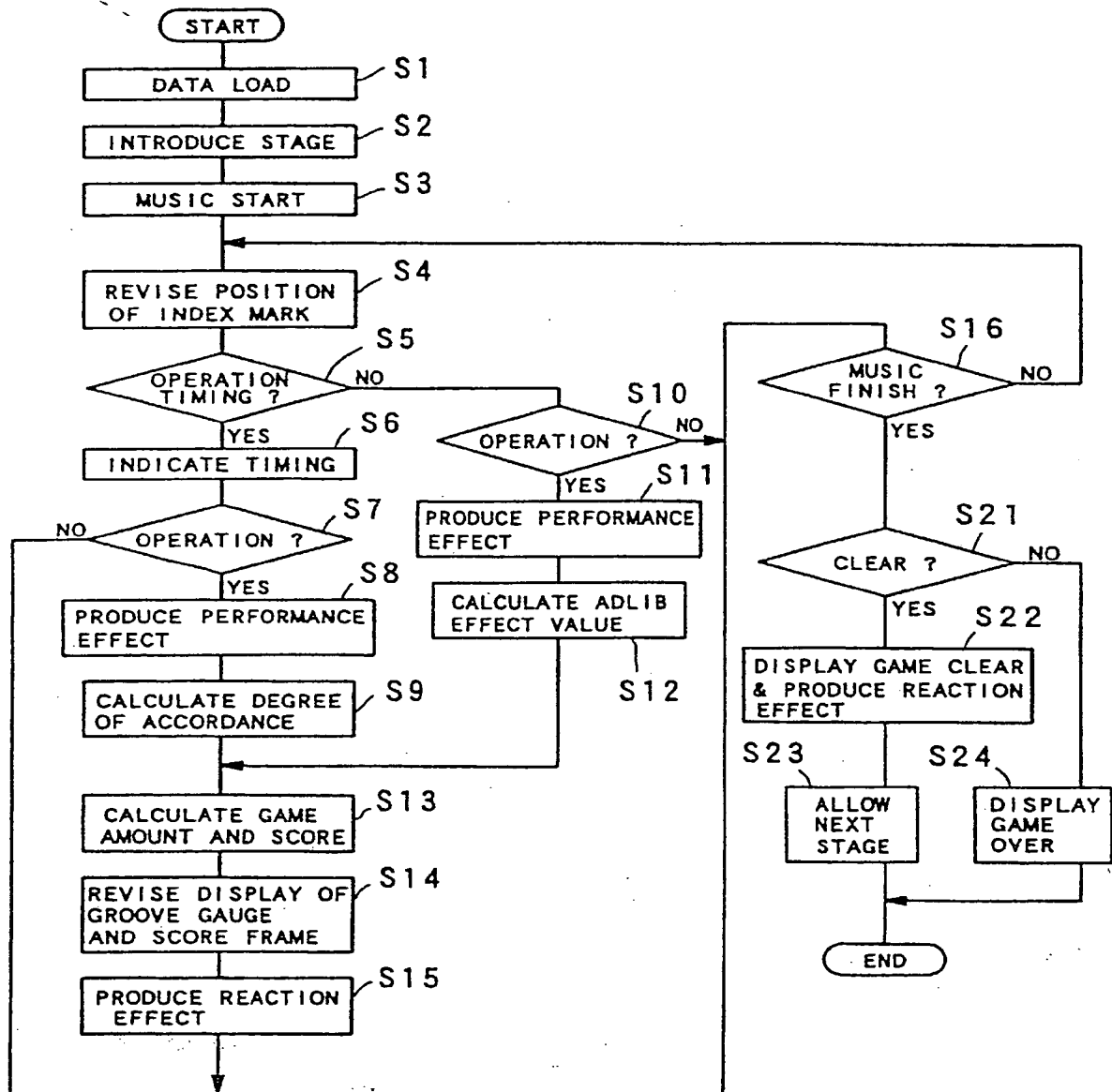


FIG. 13A

DATA SET OF MUSICAL COMPOSITION X

WAVE FORM DATA
WAVE FORM TABLE DATA
PERFORMANCE DATA

FIG. 13B

WAVE FORM DATA

BGM DATA
SOUND EFFECT DATA

FIG. 13C

WAVE FORM TABLE DATA

WAVE FORM ADDRESS
WAVE SIZE
PAN POT
PORT NUMBER

FIG. 14

PERFORMANCE DATA

OPERATION TIMING DATA FOR EASY MODE
AUTOMATIC PLAY TIMING DATA FOR EASY MODE
OPERATION TIMING DATA FOR NORMAL MODE
AUTOMATIC PLAY TIMING DATA FOR NORMAL MODE
WAVE FORM NUMBER DESIGNATION DATA
TEMPO DATA

FIG. 15

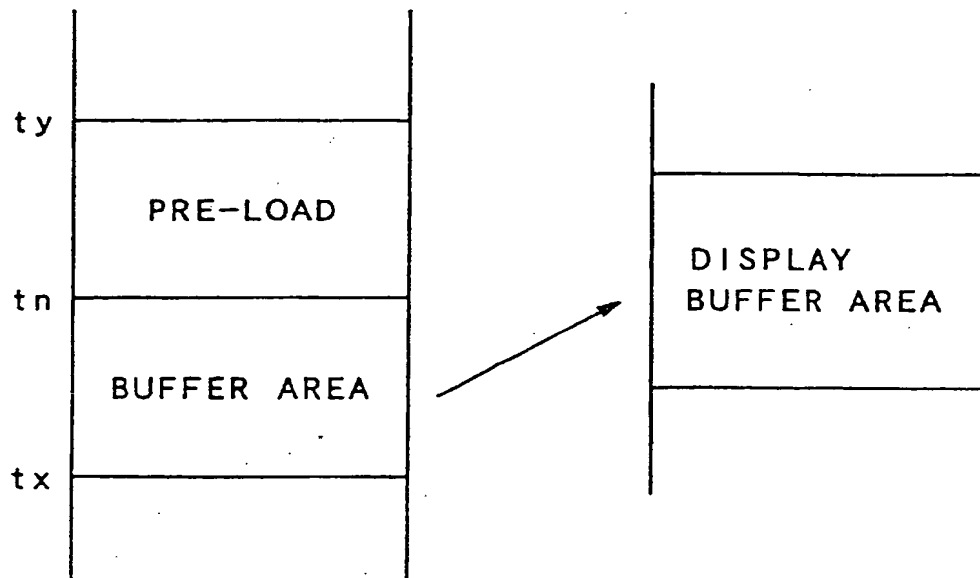


FIG.1 6

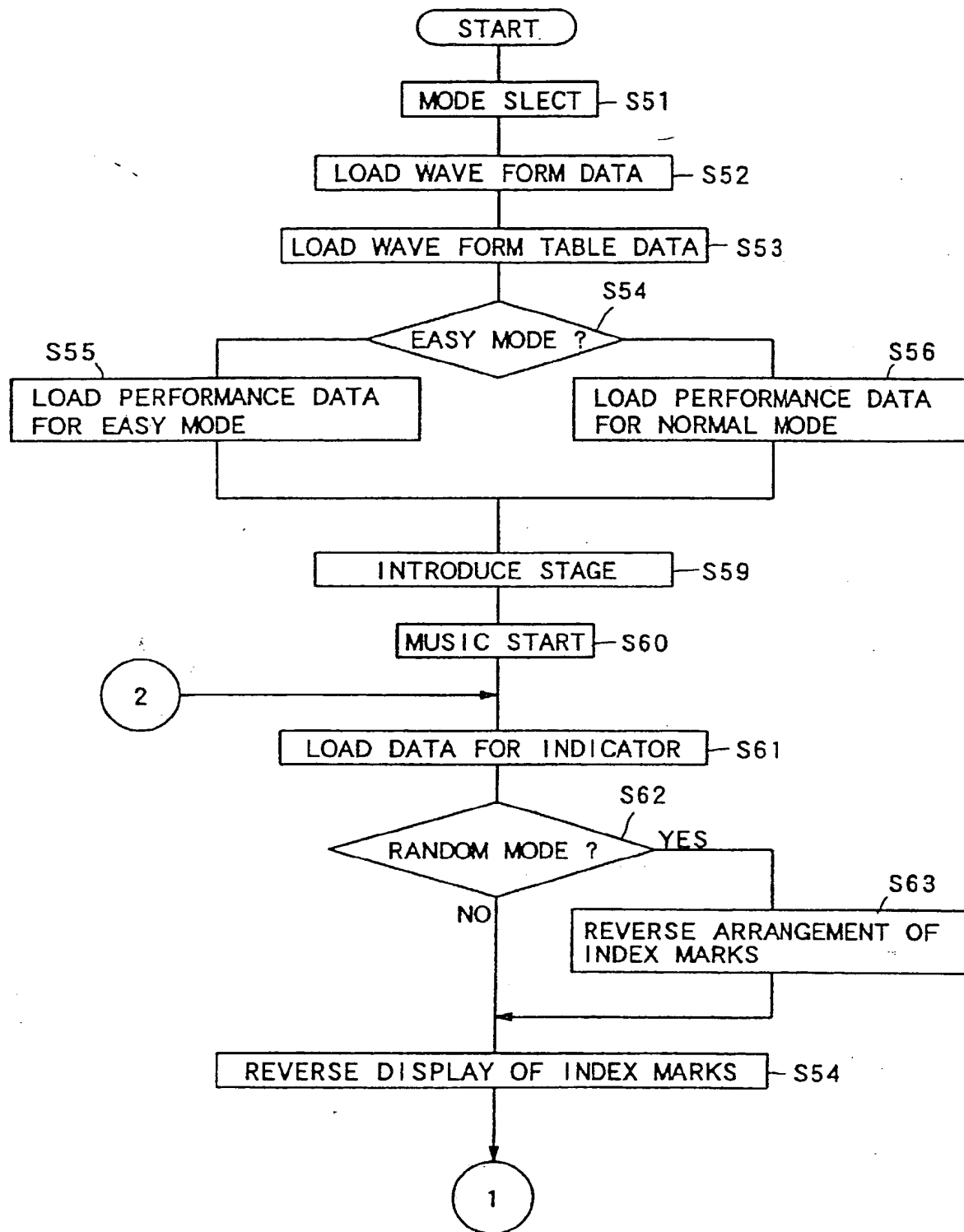


FIG.17

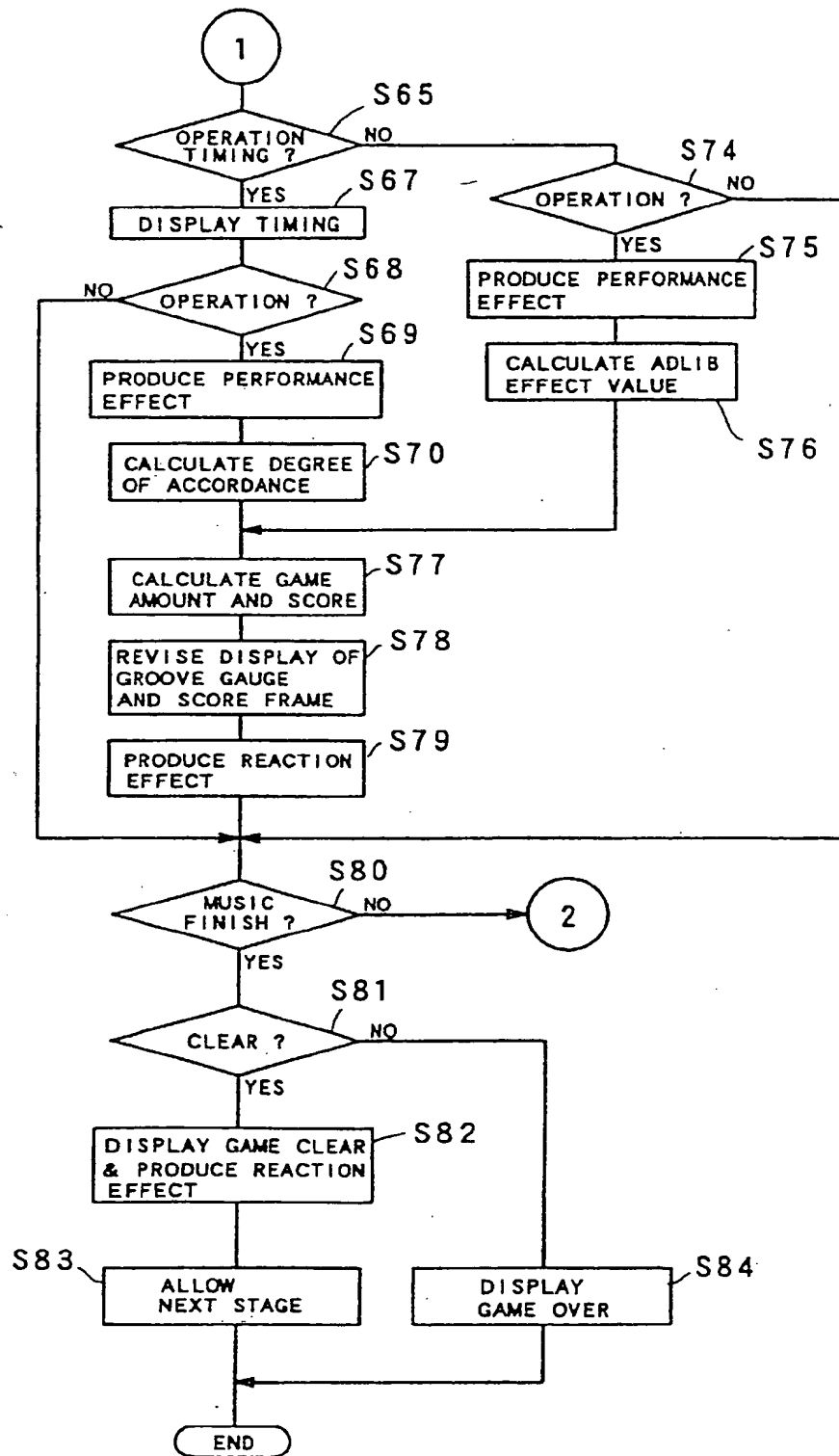


FIG. 18

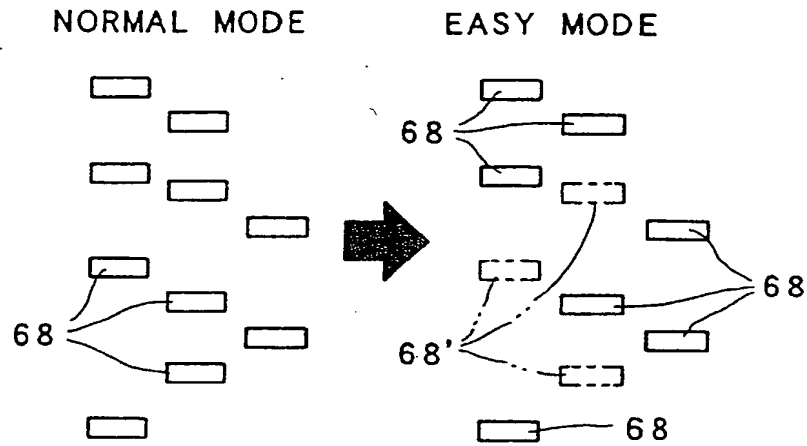


FIG. 19

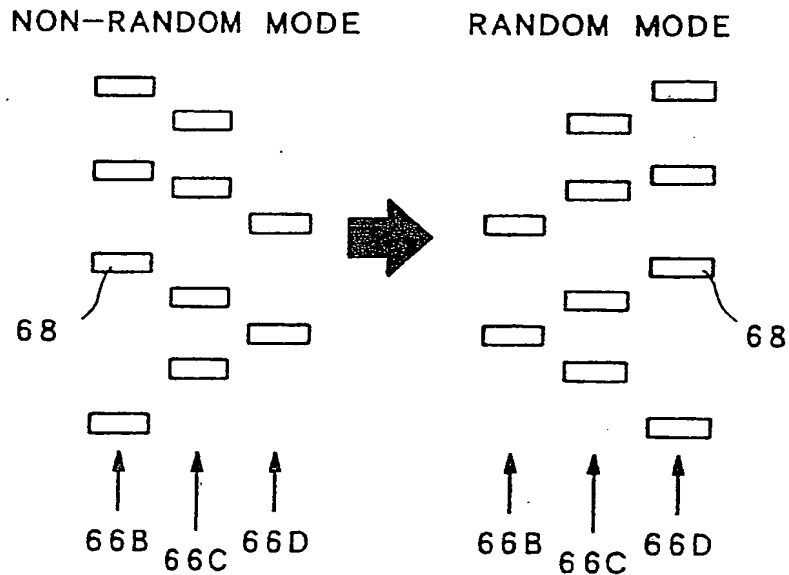


FIG. 20

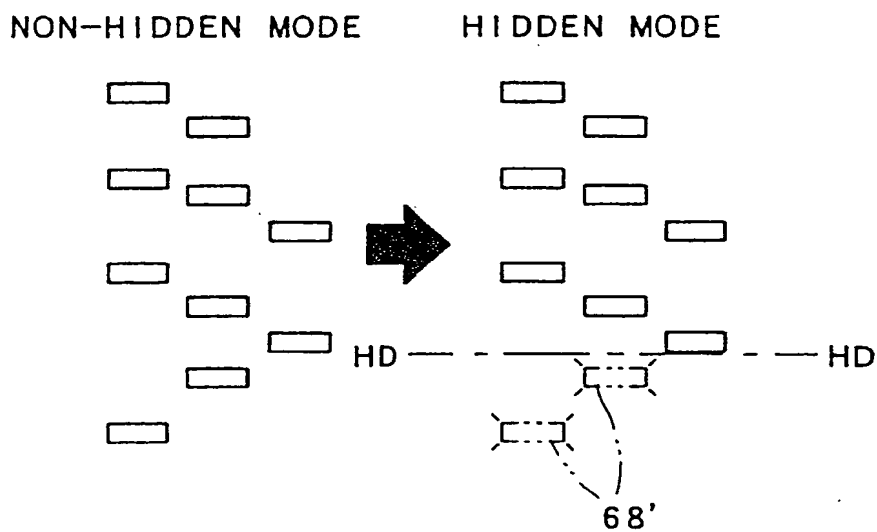


FIG. 21

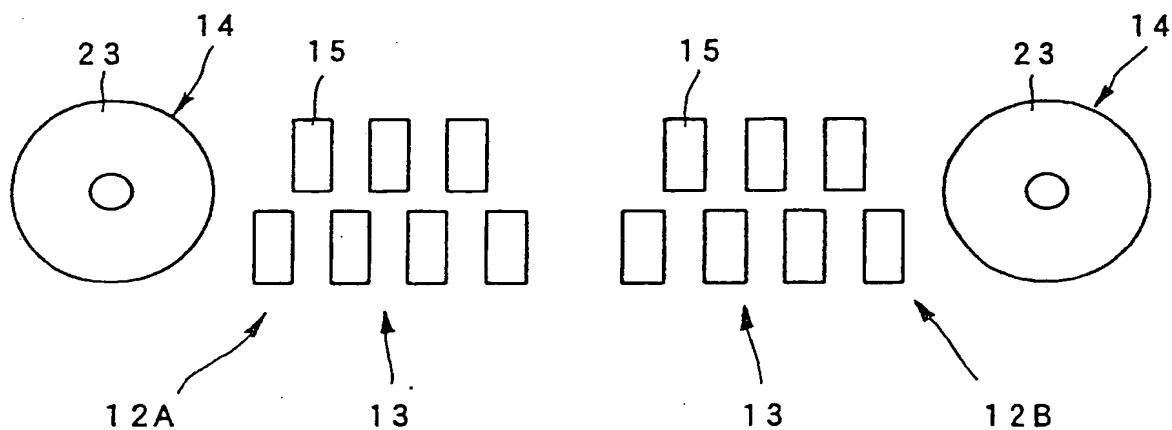


FIG. 22

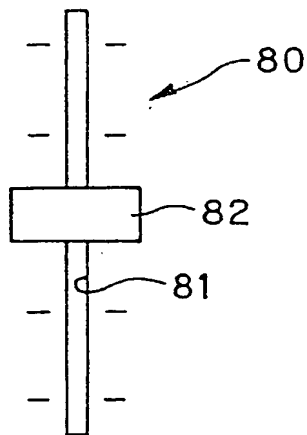


FIG. 23A

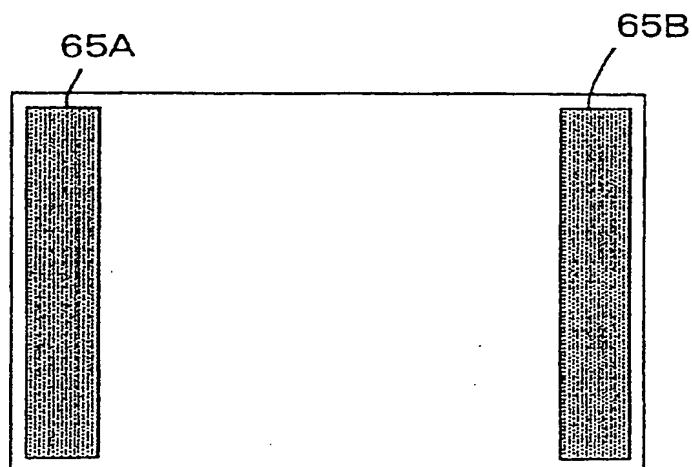
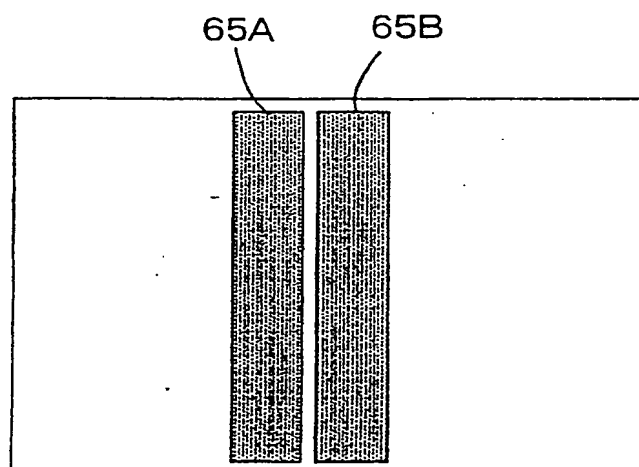


FIG. 23B



(19)



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(11)

EP 0 903 169 A3

(12)

EUROPEAN PATENT APPLICATION

(88) Date of publication A3:
08.03.2000 Bulletin 2000/10

(51) Int Cl.7: A63F 9/22

(43) Date of publication A2:
24.03.1999 Bulletin 1999/12

(21) Application number: 98307501.1

(22) Date of filing: 16.09.1998

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
MC NL PT SE
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: 17.09.1997 JP 25220897
31.07.1998 JP 21805698

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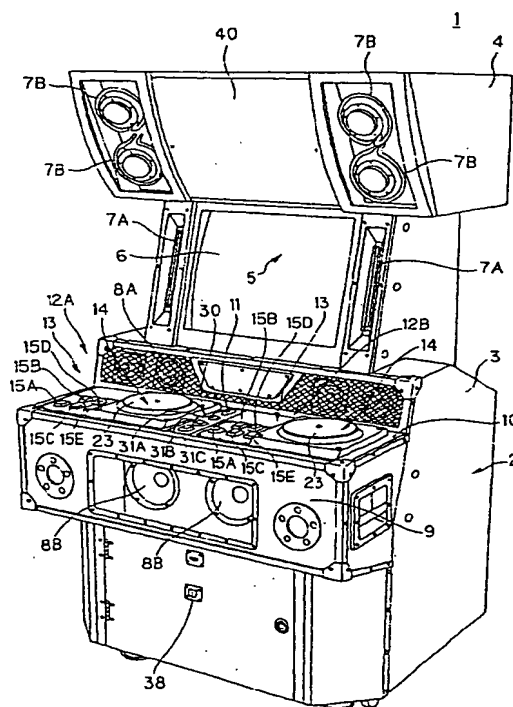
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(54) Music action game machine, performance operation instructing system for music action game and storage device readable by computer

(57) The music action game machine comprises: a main body; an operation input device disposed on a front side of the main body so as to be adjacent to hands of a player facing the front side of the main body, the operation input device having a plurality of operation members; a storage device for storing data of a musical composition and data of a performance procedure associated with the musical composition; a music play device for playing the musical composition based on the data stored in the storage device; an operation instructing device for giving the player a visual instruction to operate the operation members in accordance with progress of a play of the musical composition based on the data stored in the storage device; an effect producing device for producing a performance effect in response to a performance operation performed by the player to each of the operation members; an estimation device for estimating the performance operation of the player based on a relationship between the performance procedure defined by the data stored in the storage device and the performance operation of the player; and an estimation informing device for informing the player of an estimation result determined by the estimation device. Therefore, the player can enjoy the simulation of the performance of the music through the operation of the operation members.

FIG.1



EP 0 903 169 A3



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 98 30 7501

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	US 4 694 723 A (SHINOHARA ISAO ET AL) 22 September 1987 (1987-09-22) * column 2, line 12 - line 66 * * column 3, line 22 - column 5, line 55 *	1,23,24	A63F9/22
A	US 4 752 069 A (OKADA KAZUO) 21 June 1988 (1988-06-21) * abstract *	1,23,24, 36	
A	US 5 355 762 A (TABATA TOSHIYUKI) 18 October 1994 (1994-10-18) * column 4, line 60 - column 5, line 13 * * column 12, line 5 - column 13, line 59 *	1,23,24, 39-41	
A	US 5 649 861 A (OKANO TETSU ET AL) 22 July 1997 (1997-07-22)		
A	DE 297 03 145 U (IDE INTERNATIONAL DESIGN & ENT) 24 April 1997 (1997-04-24)		
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			A63F G10H
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 14 January 2000	Examiner Wentzel, J
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons</p> <p>& : member of the same patent family, corresponding document</p>			

EPO FORM 1503 03.02 (104C01)

(19)



Europäisches Patentamt
European Patent Office
Office européen des brevets



(11)

EP 1 132 888 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
12.09.2001 Bulletin 2001/37

(51) Int Cl.7: G10H 1/00, G10H 1/34

(21) Application number: 01300588.9

(22) Date of filing: 23.01.2001

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
MC NL PT SE TR
Designated Extension States:
AL LT LV MK RO SI

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(30) Priority: 24.01.2000 KR 2000003142

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(54) Program drive device for computers

(57) A program drive device for computers and game machines, to control a variety of game programs, aerobic programs or dance programs in response to physical movement of a user comprises a pad (2) provided with a plurality of rails (1a, 1b, 1c, 1d) thereon. A respective upstanding support column (3) movably engages each of the rails and is movable along and may be fixed to the rail at an adjustable position. Upper and

lower sensor units (4, 5) are movably installed on upper and lower portions of the support columns such that they are movable along the length thereof and may be fixed thereto at adjustable positions. The sensor units (4, 5) sense motion of the body of a user moving on the pad and output motion signals to a computer, thus allowing the computer to display motion of a character, corresponding to the motion of the user, on the monitor of the computer.

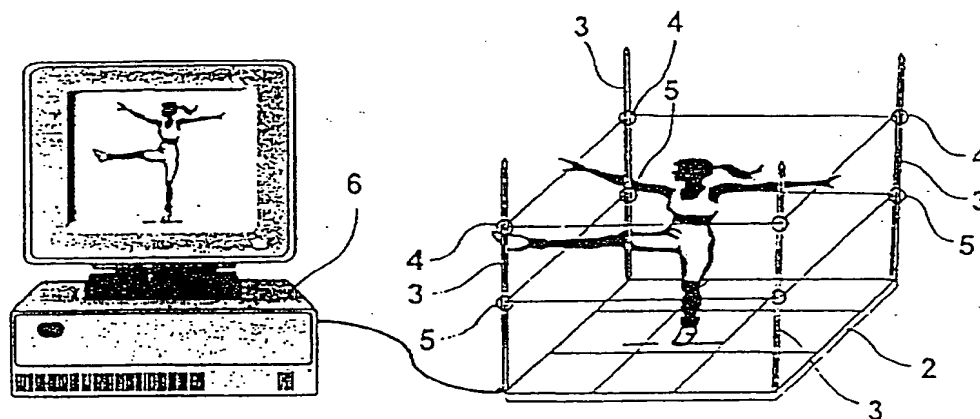


FIG. 1

EP 1 132 888 A1

Description

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention relates to a program drive device for computers and game machines, designed to run a variety of game programs, aerobic programs or dance programs on personal computers, commercial computers, personal game machines, or commercial game machines, under the control of users' physical action, such as hand action and foot action, within a limited space, and, more particularly, to a program drive device for computers, having a plurality of sensor units movably installed in a plurality of support columns movably standing on a pad having a predetermined area, each of the sensor units consisting of a light emitting part and a light receiving part so as to be activated or inactivated by a motion of a user's body and outputting a motion signal to the input port of a computer, thus running a variety of game programs, aerobic programs or dance programs on personal computers, commercial computers, personal game machines, or commercial game machines, under the control of users' physical action in place of a conventional keyboard operation, joystick operation or mouse operation.

Description of the Prior Art

[0002] As well known to those skilled in the art, a variety of game programs, aerobic programs or dance programs for personal computers, commercial computers, personal game machines, or commercial game machines have been typically performed and controlled by operating keyboards, joysticks, or mice.

[0003] However, such conventional game programs, aerobic programs or dance programs for computers and game machines force a user to operate a keyboard, a joystick or a mouse with his fingers while sitting in a chair and watching a monitor screen for a lengthy period of time without moving his body actively. Therefore, it is almost impossible to expect active physical exercise from use of such conventional programs. The conventional game programs, aerobic programs or dance programs for computers and game machines may adversely affect users' health when users use the programs for a lengthy period of time.

[0004] In an effort to overcome such problems experienced in the conventional game programs, aerobic programs or dance programs, somewhat active programs, such as a variety of DDR (Dance-Dance Revolution) programs, have been proposed. In order to perform a conventional DDR program, a user, standing on a control pad provided with differently oriented arrow switch sensors and laid on a flat support surface, continuously, actively and specifically steps on the arrow switch sensors of the control pad designated by quickly

varying images displayed on the monitor screen. However, such conventional DDR programs only provide two-dimensional activity -in addition to jumping activity- performed by legs and feet within a limited area defined by the control pad. Therefore, the conventional DDR programs are problematic in that they cannot provide physical exercise or rhythmic movement of user's upper body, including arms and hands, even though they allow physical exercise and rhythmic movement of user's lower body including the legs and feet.

SUMMARY OF THE INVENTION

[0005] Accordingly, the present invention has been made keeping in mind the above problems occurring in the prior art, and an object of the present invention is to provide a program drive device for computers, which has a plurality of sensor units movably installed in a plurality of support columns of a pad, and consisting of a light emitting part and a light receiving part so as to be activated or inactivated by a motion of a user's body, and outputting a motion signal to the input port of a computer, thus running a variety of game programs, aerobic programs or dance programs on personal computers, commercial computers, personal game machines, or commercial game machines, under the control of users' physical action in place of a conventional keyboard operation, joystick operation or mouse operation, and which provides physical exercise and rhythmic movement of user's body while exciting user's interest.

[0006] Another object of the present invention is to provide a program drive device for computers, which is usable with a conventional DDR, thus running a program in response to a motion of hands, arms, feet and legs of a user.

[0007] A further object of the present invention is to provide a program drive device for computers, which is simply and easily connected to the input port of a conventional computer, such as the keyboard terminal, joystick terminal or mouse terminal of a personal computer, commercial computer or game machine, without forcing a user to purchase a separate equipment.

[0008] Still another object of the present invention is to provide a program drive device for computers, which is designed to run a program of a computer or a game machine in response to a motion of a user's body without forcing the user to become skilled in computer operation, thus allowing people to easily and simply use game programs of computers or game machines without being afraid of complex operation procedures of the computers and game machines.

[0009] In order to accomplish the above objects, an embodiment of the present invention provides a program drive device for running a game program in computers, comprising: a pad having a predetermined area and provided with a plurality of rails thereon; a support column movably engaging with each of the rails while standing upright on the rail, the support column being

movable along the rail as desired and fixed to the rail at an adjustable position; and two sensor units movably installed in each of the support columns of the rails at upper and lower portions of the support column, thus being movable along each support column and fixed to the support column at adjustable positions, whereby the sensor units sense a motion of a user's body moving on the pad and output motion signals to a computer, thus allowing the computer to display a variable motion of a character, corresponding to the motion of the user's body, on the monitor of the computer.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] The above and other objects, features and other advantages of the present invention will be more clearly understood from the following detailed description taken in conjunction with the accompanying drawings, in which:

- Fig. 1 is a view, showing the operational theory of a program drive device for computers in accordance with the present invention;
- Fig. 2 is a plan view of the program drive device for computers of the present invention;
- Fig. 3 is a side view of the program drive device for computers of this invention, particularly showing an opposite directional movement of sensor units relative to vertical support columns; and
- Fig. 4 is a perspective view of the program drive device for computers of this invention, particularly showing an assemblage of one support column on a control rail of the device, with an arrangement of two sensor units movably installed in the support column.

DETAILED DESCRIPTION OF THE INVENTION

[0011] Figs. 1 to 4 show the operational theory and construction of a program drive device for computers in accordance with the preferred embodiment of the present invention. As shown in the drawings, the program drive device of this invention comprises a rectangular pad 2 having a predetermined area and including a control rail 1 consisting of four diagonally positioned rails 1a, 1b, 1c and 1d. Four movable folding support columns 3, having a rectangular cross-section, are vertically installed at the four corners of the pad 2 such that the columns 3 are movable along the four rails 1a, 1b, 1c and 1d. Upper and lower sensor units 4 and 5 are provided at the upper and lower positions of each support column 3 such that the sensor units 4 and 5 are vertically movable in opposite directions along each support columns 3 under the guidance of vertical slits as will be described in detail later herein. Each of the upper and lower sensor units 4 and 5 comprises a light receiving part 41 or 51 and a light emitting part 42 or 52. In such a case, the light receiving parts and light emitting

parts of the upper and lower sensor units 4 and 5 are selected from a variety of photo sensors, such as infrared sensors and laser sensors, and are positioned on the two inside walls 31 and 32 of each support column 3, with the two inside walls 31 and 32 meeting each other at a right angle. In the present invention, the light receiving parts and light emitting parts of the upper and lower sensor units 4 and 5 may be selected from a variety of transmissive or reflective photo sensors. The above sensor units 4 and 5 are connected to a signal input port of a computer 6, such as the keyboard terminal, joystick terminal or mouse terminal of a personal computer, a commercial computer, or a game machine, and so motion signals from the sensor units 4 and 5 are applied to the computer 6 during an operation of the program drive device.

[0012] In the above program drive device, the control rail 1, consisting of four diagonal rails 1a, 1b, 1c and 1d, has a longitudinal channel 11 formed along the rail 1. A movable connector 14 engages with the channel 11 of each of the four diagonal rails 1a, 1b, 1c and 1d such that the movable connector 14 is movable along the longitudinal channel 11. Each of the movable connectors 14 comprises a roller 12 movably set in the channel 11. A top boss 13 is formed at the top of the connector 14, and is projected upward from the channel 11. Each of the four support columns 3, having a bottom boss 39 at its lower end, is hinged to the top boss 13 of an associated movable piece 14 at the bottom boss 39 using a locking bolt 15. Therefore, the four support columns 3 movably engage with the four rails 1a, 1b, 1c and 1d of the control rail 1 while being movable along said rails and being foldable relative to the rails.

[0013] The four support columns 3 have the same shape and construction. Each of the four columns 3 is hollowed to have an axial opening 35, with two upper guide slits 33 and 33' and two lower guide slits 34 and 34' longitudinally formed on the two inside walls 31 and 32 of the column 3. Two locking slits 37 and 37' are longitudinally formed on one of the two outside walls 36 of each support column 3 at upper and lower positions in the same manner as that described for the longitudinal guide slits. Two support blocks 43 and 53 are movably installed within the opening 35 of each support column 3 at upper and lower positions corresponding to the upper and lower guide slits. The upper and lower sensor units 4 and 5, each having a light receiving part 41 or 51 and a light emitting part 42 or 52 selected from infrared sensors or laser sensors, are mounted to the two support blocks 43 and 53 movably installed within the opening 35 of each support column 3. The position of the movable sensor units 4 and 5 inside each support column 3 is selectively fixed by locking bolts 38 and 38'. [0014] The two light receiving parts 41 and 51 and two light emitting parts 42 and 52 of the upper and lower sensor units 4 and 5 installed in each support column 3 are positioned to face the two light emitting parts 42 and 52 and two light receiving parts 41 and 51 of two neigh-

boring support columns 3. Therefore, the light emitting parts 42 and 52 of each support column 3 emit infrared rays or laser beams to the light receiving parts 41 and 51 of one neighboring support column 3, while the light receiving parts 41 and 51 of each support column 3 receive infrared rays or laser beams output from the light emitting parts 41 and 51 of the other neighboring support column 3. When part of the body of a user, such as hands, arms, feet or legs, is positioned at or passes through the paths of infrared or laser beams during an active movement of the user standing on the limited area of the pad 2, the beams are temporarily blocked. The infrared or laser beams from the light emitting parts 42 and 52 of the four columns 3 are thus intermittently intercepted by the body of the user, and so the light receiving parts 41 and 51 of the columns 3 are repeatedly and alternately activated and inactivated. Therefore, the signal units 4 and 5 of the four columns 3 output ON/OFF signals to the input port of the computer 6, such as the keyboard terminal, joystick terminal or mouse terminal of a personal computer, a commercial computer or a game machine. In response to the ON/OFF signals from the sensor units 4 and 5, the computer 6 performs the program in the same manner as that performed in accordance with input signals from a conventional keyboard, joystick or mouse operated by a user.

[0015] When the pad 2 of the present invention is designed as a foot-operable pad in the same manner as that of a conventional DDR, a user can activate or inactivate the light receiving parts 41 and 51 of the sensor units 4 and 5 of the support columns 3 with parts of his body, such as hands, arms, feet and legs, while controlling the pad by jumping activity performed by legs and feet within the limited area of the pad. In such a case, the user operates the program as if he moves in a virtual space, and so the program drive device of this invention can provide desired active physical exercise or active rhythmic movement of user's body including arms, hands, feet and legs.

[0016] In the above-mentioned preferred embodiment, the program drive device of this invention has four support columns 3 at the corners of the rectangular pad 2, and so the device only allows a user to use the program while moving in four directions, that is, forward, backward leftward and rightward directions. However, it should be understood that the number of support columns 3, each having the upper and lower sensor units 4 and 5, may be increased as desired. For example, eight support columns 3, each having the upper and lower sensor units 4 and 5 at its upper and lower portions, may be vertically installed at the four corners and the middle positions of the four sides of the pad 2. In such a case, the device preferably allows a user to use the program while moving in eight directions. In addition, sixteen support columns 3, each having the upper and lower sensor units 4 and 5, may be vertically installed on the pad 2 at predetermined positions so as to allow a user to use the program while moving in sixteen direc-

tions. Therefore, it is noted that the program drive device of this invention can allow a user to use the program while moving in four, eight or sixteen directions in accordance with the number of support columns 3.

[0017] In the present invention, it is possible to adjust the position of the support columns 3 on the control rail 1 of the pad 2 as desired. In addition, the sensor units 4 and 5 are movable along the guide slits 33, 33', 34 and 34' of each support column 3 of the pad 2, and so the height of the sensor units 4 and 5 of the support columns 3 may be adjustable as desired. Therefore, it is possible for users, regardless of height or physique, to effectively use the program drive device of this invention while adjusting the size of the motion space of the device by changing the positions of the columns 3 and the sensor units 4 and 5.

[0018] In the preferred embodiment, the control rail 1 is installed on the rectangular pad 2, with four support columns 3 having two movable sensor units 4 and 5 and vertically positioned at the corners of the pad 2 such that the position of the columns 3 on the rail 1 is adjustable as desired. However, it should be understood that the support columns 3, having two movable sensor units 4 and 5, may stand upright on a support surface in place of the pad 2 at desired positions, thus defining a desired motion space by the sensor units 4 and 5 of the columns 3. Therefore, the program drive device of this invention can be easily installed on a support surface without being limited in its installation area, and allows users to run a variety of game programs, aerobic programs or dance programs on personal computers, commercial computers, personal game machines, or commercial game machines, under the control of users' physical action, such as hand action, arm action, foot action and leg action, within a limited space.

[0019] As described above, the present invention provides a program drive device for computers. This program drive device has a plurality of sensor units movably installed in a plurality of support columns of a pad. Each of the sensor units consists of a light emitting part and a light receiving part so as to be activated or inactivated by a motion of a user's body, and outputs a motion signal to the input port of a computer, thus running a variety of game programs, aerobic programs or dance programs on personal computers, commercial computers, personal game machines, or commercial game machines, under the control of users' physical action in place of a conventional keyboard operation, joystick operation or mouse operation. The program drive device of this invention provides physical exercise and rhythmic movement of user's body while exciting user's interest. In addition, the program drive device of this invention is designed to run a game program of a computer or a game machine in response to a motion of a user's body without forcing the user to become skilled in computer operation, thus allowing people to easily and simply use game programs of computers or game machines without being afraid of complex operation procedures of the com-

puters and game machines. This program drive device is also usable with a conventional DDR, thus running a program in response to a motion of hands, arms, feet and legs of a user. Another advantage of this program drive device resides in that it is simply and easily connected to the input port of a conventional computer, such as the keyboard terminal, joystick terminal or mouse terminal of a personal computer, commercial computer or game machine, without forcing a user to purchase a separate equipment.

[0020] Although a preferred embodiment of the present invention has been described for illustrative purposes, those skilled in the art will appreciate that various modifications, additions and substitutions are possible, without departing from the scope and spirit of the invention as disclosed in the accompanying claims.

Claims

1. A program drive device for controlling a program in a computer, comprising:

a pad provided with a plurality of rails thereon; a support column movably engaging and upstanding from each of said rails, the support columns being movable along the rails as desired and fixable thereto at an adjustable position; and

sensor means installed on each of the support columns and being movable along the length thereof and fixable thereto at an adjustable position,

whereby the sensor means senses motion of the body of a user moving on the pad and outputs a motion signal to the computer, thus allowing the computer to display movement of a character, corresponding to the motion of the user's body, on a monitor of the computer.

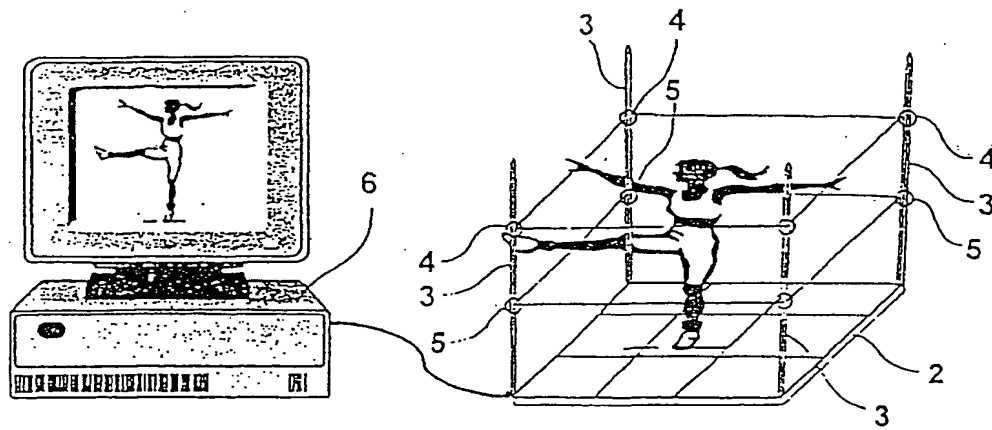
2. A program drive device as claimed in Claim 1, wherein the sensor means is connected to a signal input port, comprising a keyboard terminal, a joystick terminal or a mouse terminal of a personal computer, a commercial computer or a game machine.

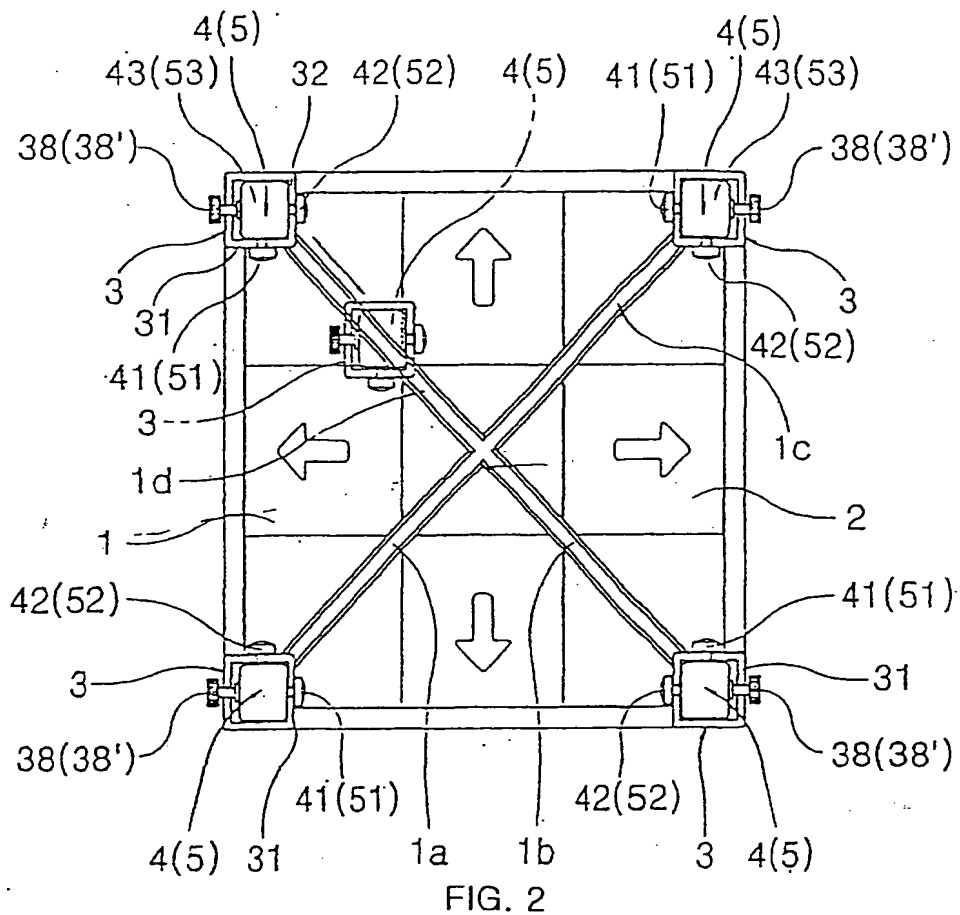
3. A program drive device as claimed in Claim 1 or 2, wherein the sensor means comprises upper and lower sensor units movably installed at upper and lower portions of each support column, the upper and lower sensor units being movable along the support column and each consisting of a light emitting portion and a light receiving portion comprising a photo sensor capable of sensing motion of the user's body, the light emitting and light receiving portions being positioned on two mutually perpendicular walls of the support column.

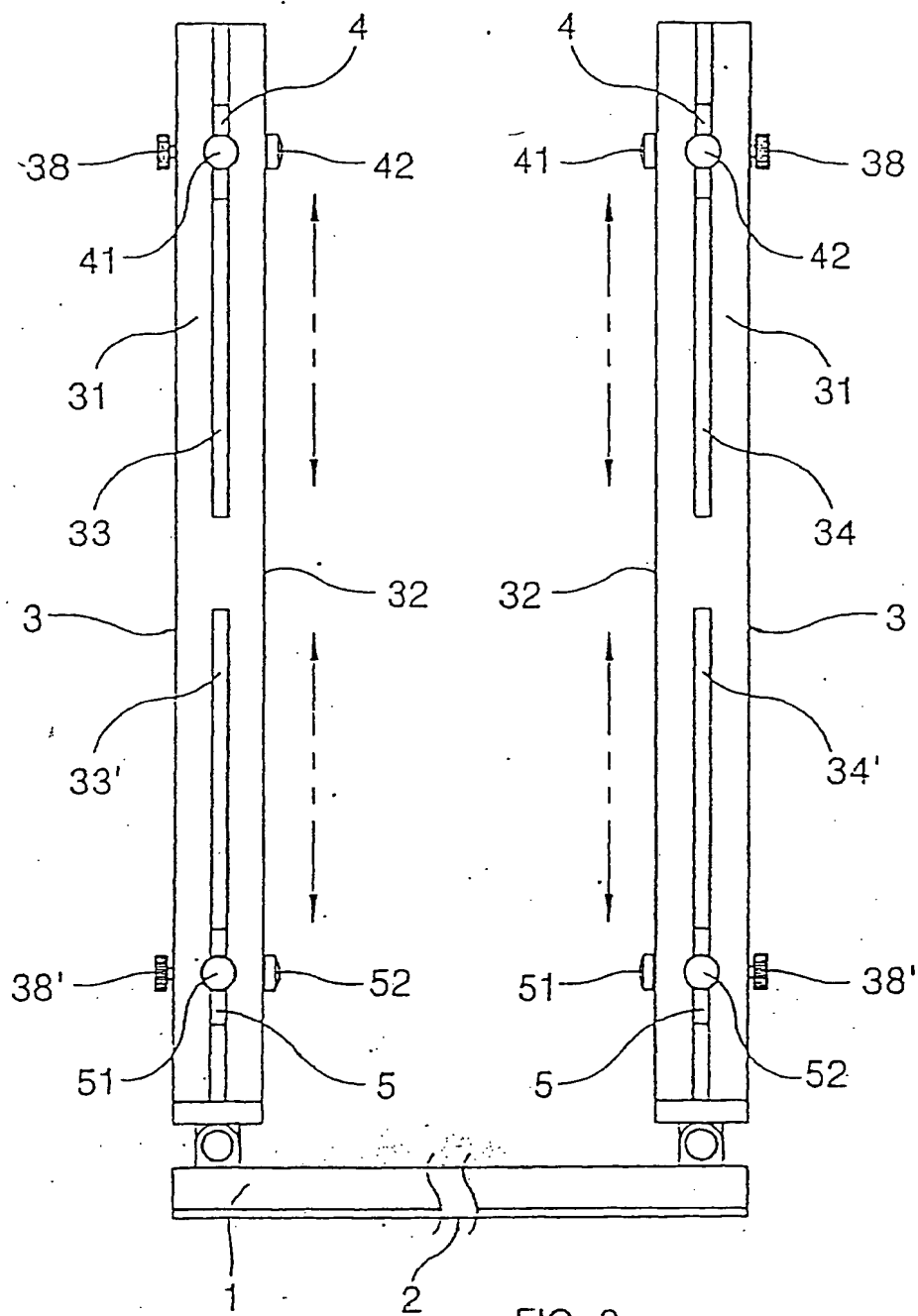
4. A program drive device as claimed in any one of claims 1 to 3, wherein the sensor means comprises a transmissive photo sensor.

5. A program drive device as claimed in any one of Claims 1 to 3, wherein said sensor means comprises a reflective photo sensor.

6. A program drive device as claimed in any one of claims 1 to 6, wherein each support column is foldable relative to the pad and is thus movable between a vertical and a horizontal position.







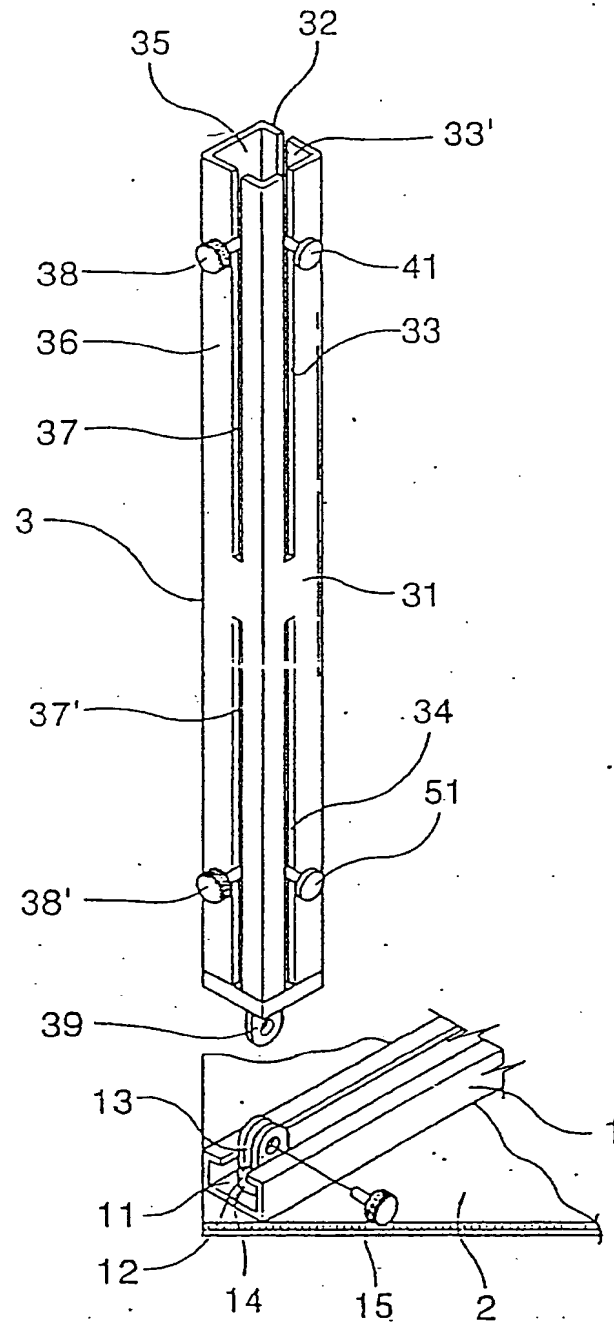


FIG. 4



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 01 30 0588

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A	US 5 017 770 A (SIGALOV HAGAI) 21. May 1991 (1991-05-21) * column 2, line 51 - line 64 * * column 4, line 29 - line 45 * * column 6, line 60 - column 8, line 25 * * column 9, line 45 - line 68; figures 1,3A,7-9 *	1-6	G10H1/00 G10H1/34
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A	EP 0 342 037 A (GURNER ASAF) 15 November 1989 (1989-11-15) * column 2, line 33 - column 4, line 9 * * column 7, line 31 - column 8, line 8; figures 1,3 *	1-6	
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The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
THE HAGUE		18 July 2001	Pulluard, R
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X: particularly relevant if taken alone Y: particularly relevant if combined with another document of the same category A: technological background O: non-written disclosure P: intermediate document</p> <p>T: theory or principle underlying the invention E: earlier patent document, but published on, or after the filing date D: document cited in the application L: document cited for other reasons &: member of the same patent family, corresponding document</p>			

EPC FORM 1503 03 02 7640311

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 01 30 0588

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

PATENT ABSTRACTS OF JAPAN

(11)Publication number : 08-335088

(43)Date of publication of application : 17.12.1996

(51)Int.Cl.

G10K 15/04

G09B 15/00

G11B 27/34

(21)Application number : 07-143005

(71)Applicant : FUJI ELECTRIC CO LTD
FUJI FACOM CORP

(22)Date of filing : 09.06.1995

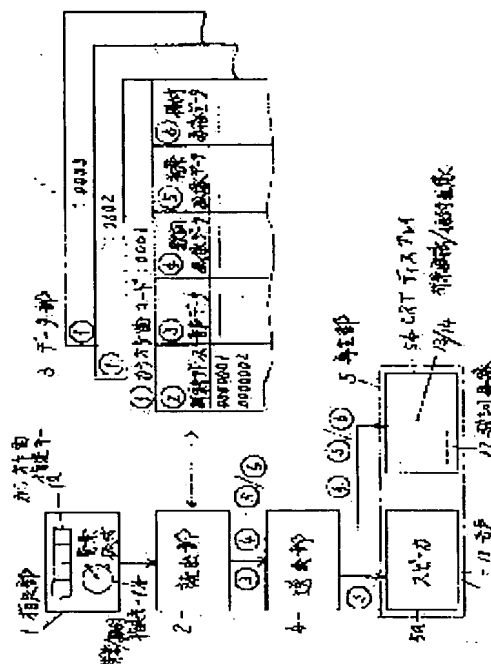
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(54) KARAOKE DEVICE WITH CHOREOGRAPHY DISPLAYING FUNCTION

(57)Abstract:

PURPOSE: To selectively display a choreographic image on a CRT screen so as to be suitable for dancing over a karaoke song.

CONSTITUTION: A designating part 1 has a karaoke song designating key 1a and a background/choreography designating key 1b. A data part 3 stores various data related to karaoke songs. Namely, voice data (3), words image data (4), background image data (5), and choreographic image data (6) are provided in every karaoke song code (1) according to a time address (2). A reading part 2 regularly reads the voice data (3) and words image data (4) corresponding to the designated karaoke song code (1) and alternately reads each of the background and choreographic image data (5), (6) on the basis of the designation in order of the time address (2). Each of data is converted into a voice 11 by the speaker 5a of a reproducing part 5 through a transmitting part 4, and a words image 12 and a background image 13 or choreographic image 14 are displayed on a CRT display 5b.



LEGAL STATUS

[Date of request for examination] 10.03.2000

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than withdrawal the examiner's decision of rejection or application converted registration]

[Date of final disposal for application] 07.02.2002

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision]

of rejection]

[Date of requesting appeal against examiner's
decision of rejection]

[Date of extinction of right]

(19) 日本国特許庁 (J P)

(12) 公開特許公報 (A)

(11) 特許出願公開番号

特開平8-335088

(43) 公開日 平成8年(1996)12月17日

(51) Int.Cl. ⁶	識別記号	庁内整理番号	F I	技術表示箇所
G 1 0 K 15/04	3 0 2		G 1 0 K 15/04	3 0 2 D
G 0 9 B 15/00			G 0 9 B 15/00	D
G 1 1 B 27/34			G 1 1 B 27/34	P

審査請求 未請求 請求項の数 3 O L (全 6 頁)

(21) 出願番号 特願平7-143005

(22) 出願日 平成7年(1995)6月9日

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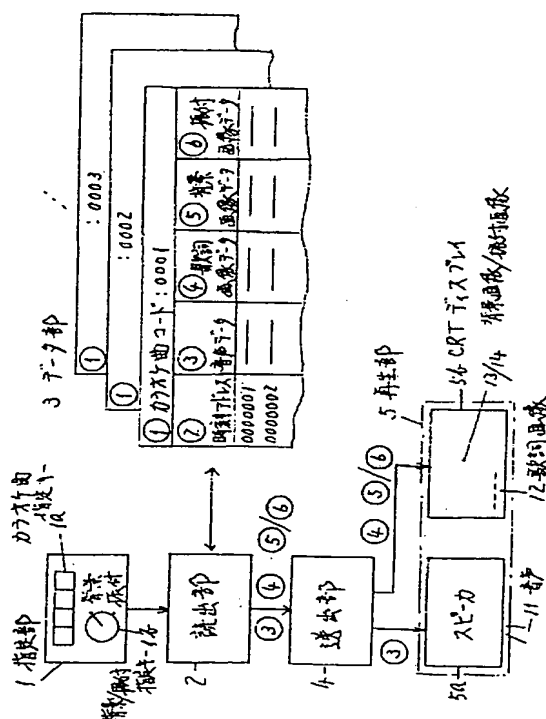
(74) 代理人 弁理士 山口 巖

(54) 【発明の名称】 振付表示機能付きカラオケ装置

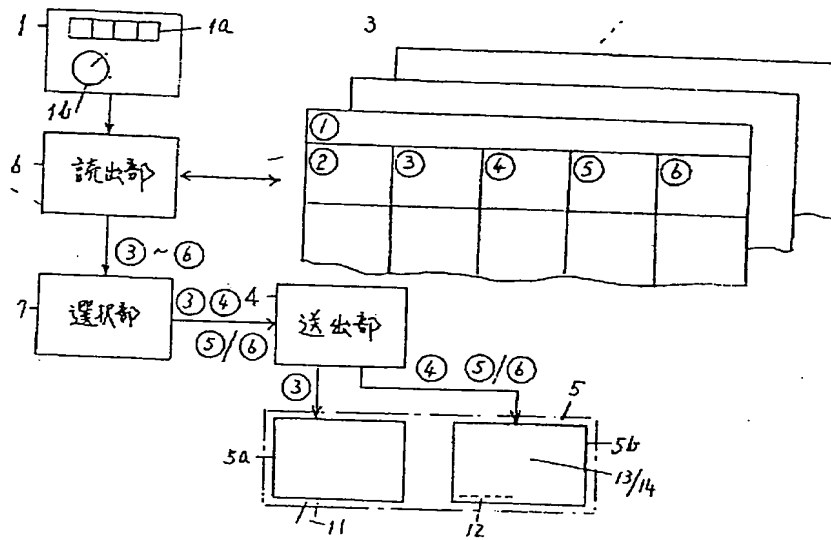
(57) 【要約】

【目的】カラオケを歌いながら踊るのに好適のように、C R T 画面に選択的に振付画像を表示させる。

【構成】指定部1は、カラオケ曲指定キー1aと、背景／振付指定キー1bとを備える。データ部3は、カラオケ曲に係る各種データを格納する。つまり、①カラオケ曲コードごとに、②時刻アドレスに応じて、③音声データ、④歌詞画像データ、⑤背景画像データ、⑥振付画像データを備える。読出部2は、データ部3から、指定カラオケ曲コード①にそれぞれ対応する音声データ③および歌詞画像データ④を常に、背景、振付の各画像データ⑤、⑥は指定に基づき択一的に(⑤／⑥で示す)、時刻アドレス②の順に読み出す。各データは、送出部4をへて再生部5のスピーカ5aで音声11に変換され、C R T ディスプレイ5bで、歌詞画像12と、背景画像13または振付画像14が表示される。



【図2】



【図3】

